590.673
.A59

ANIMAL KINGDOM

NEW YORK ZOOLOGICAL SOCIETY

VOLUME XLV
JANUARY TO DECEMBER, 1942
NUMBERS 1–6

Smithsonian Institution
341745
U. S. National Museum

INSTRUCTIONS TO BINDER

The 4-page signature forming the first 2 and the last 2 pages of this issue may be inserted ahead of the cover of Vol. XLV, No. 1, in binding the Volume.

CONTENTS

No. 1. JANUARY–FEBRUARY

Two Pandas – China's Gift to America . . . . *John Tee-Van* 3

How the Baby Pandas Were Captured . . . . *David Crockett Graham* 19

Flame-in-the-Forest . . . . *William Bridges* 24

Behind the Scenes: News and Notes 30

No. 2. MARCH–APRIL

Gibbons – the Smallest Apes . . . . *Jean Delacour* 35

Empire of the Ants . . . . *Theodore Kazimiroff* 40

Pictures 43

Pisces in Leo . . . . *Christopher W. Coates* 47

The Frogs of Paradox Pond . . . . *Raymond L. Ditmars* 51

Behind the Scenes: News and Notes 56

No. 3. MAY–JUNE

Zoo Babies . . . . *Claude W. Leister* 59

Physalia, the Fish-eater . . . . *E. W. Gudger* 62

Eagle Flight 67

Questions Everybody Asks About Snakes. I. . . . . . *Robert Mathewson* 71

It's Nesting Time Again . . . . *William Bridges* 75

Behind the Scenes: News and Notes 79

No. 4. JULY–AUGUST

Raymond L. Ditmars . . . . *Fairfield Osborn* 83

Strangers in Our Midst . . . . *Paul Griswold Howes* 85

An Octopus On Guard . . . . *Charles M. Breder, Jr.* 95

Questions Everybody Asks About Snakes. II. . . . . . *Robert Mathewson* 95

Birds Astray . . . . *William Bridges* 99

Behind the Scenes: News and Notes 102

DEC - 8 1942

No. 5. SEPTEMBER–OCTOBER

Fifteen Years with Indo-Chinese Birds. II . . . . . . *Jean Delacour* 107
Can We Save the Giant Tortoise? . . . . . . *Charles H. Townsend* 109
The Story Behind a Memorandum . . . . *William Bridges* 112
Zoo Assignment: Pictures . . . . *David B. Eisendrath, Jr.* 115
How Are the Giant Pandas? . . . . *Leonard J. Goss* 120
Behind the Scenes: News and Notes 123

No. 6. NOVEMBER–DECEMBER

Stoep Studies . . . . *William Beebe* 131
Citizens of the Jungle 138
Darwin's Finches . . . . *Robert T. Orr* 142
Problem Animal: The Moose . . . . *William Bridges* 146
Behind the Scenes: News and Notes 151
Index to Volume XLV 155

XLV · No. 1 JANUARY–FEBRUARY 1942

ANIMAL KINGDOM

BULLETIN, PUBLISHED BY THE
NEW YORK ZOOLOGICAL SOCIETY

NA'S GIFT OF GIANT PANDAS, *by John Tee-Van* · HOW THE BABY PANDAS
E CAPTURED, *by Dr. Graham* · FLAME-IN-THE-FOREST, *by William Bridges*

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

ASST. TREASURER
City Bank Farmers Trust Company

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
George C. Clark
C. Suydam Cutting
Alfred Ely
Marshall Field
De Forest Grant
David H. McAlpin
Robert Moses
Fairfield Osborn

BOARD OF TRUSTEES

Class of 1943

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

William Bridges . *Editor & Curator, Publications*
Jean Delacour . . . . . . *Technical Adviser*
C. J. McGahey . . . . *Comptroller*
Harry Sweeny, Jr. . *Supt., Construction & Operation*
John Tee-Van . . . . . *Executive Secretary*

ZOOLOGICAL PARK

W. Reid Blair . . . . . . *Director Emeritus*
William Beebe . . . . *Honorary Curator, Birds*
Lee S. Crandall . . . . . . *Curator, Birds*
Raymond L. Ditmars . *Hon. Curator, Reptiles & Insects*
Leonard J. Goss . . . . *Veterinarian*
Claude W. Leister . . . . *Curator, Mammals*
Harry C. Raven . . . . *Associate in Anatomy*

AQUARIUM STAFF AT ZOOLOGICAL PARK

Charles H. Townsend . . . . *Director Emeritus*
Charles M. Breder, Jr. . . . . *Director*
Christopher W. Coates . . . . *Aquarist*
Ross F. Nigrelli . . . . *Pathologist*
George M. Smith . *Research Associate in Pathology*
Homer W. Smith . *Research Associate in Physiology*
Myron Gordon . *Research Associate in Genetics*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane . . . . . *Research Zoologist*
Henry Fleming . . . . *Entomologist*
George Swanson . . . . *Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE
NEW YORK ZOOLOGICAL SOCIETY

Vol. XLV MARCH 10, 1942 No. 1

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York, N. Y. Title registered in the United States Patent Office.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

New Name

This publication started when the last century was about to close. Those were the infant days of the Society. The building of the Zoological Park, the management of the Aquarium, expeditions to far places, the creation of educational and research activities – all lay ahead. The publication was christened *"The Bulletin"* – designed as a record-book for Society happenings. The years passed. On its pages paraded the personages of the animal world – pachyderm and platypus, whale and wombat, eagle and echidna, sloth and seahorse – inhabitants of earth, sea and air. Even that very familiar genus, *Homo,* occasionally exhibited some behavioristic pattern that justified his appearance in the *Bulletin.*

After forty-six years of continuous publication, the sources which provide material remain inexhaustible – so rich and varied are the incidents of the animal world.

Fact and story regarding our own unique animal collections will continue to dominate these pages, supplemented by the observations, findings and activities of staff members. Outside articles and illustrations of general interest will be included. In the next issue a new series will be started – that of specially selected photographs to illustrate the ways and manners of animals. From time to time other new methods of presentation will be adopted. We would particularly like your comments and suggestions.

More suggestive of its contents and as a clearer guide to those who subscribe to its pages, with this issue the magazine assumes the new title of Animal Kingdom.

Fairfield Osborn

COVER

Giant pandas have an infinite capacity for relaxation; give a Giant Panda a stalk of bamboo and the world stops turning, as far as he is concerned. Our staff photographer, Richard Fidler, set up his camera, offered bamboo, and came away with the study in dreamy contentment that adorns the cover of this issue of Animal Kingdom.

●

WAR TIME

Old friends of the Bulletin may be surprised but not, we hope, displeased, to greet it under the new name of Animal Kingdom. *They may notice, too, that the weight of the cover and text paper is slightly lighter than heretofore. Their first surmise will be the right one – the war. For the duration we are going into a paper-conserving dress. The quality of what is printed on the paper will continue to be pre-war.*

●

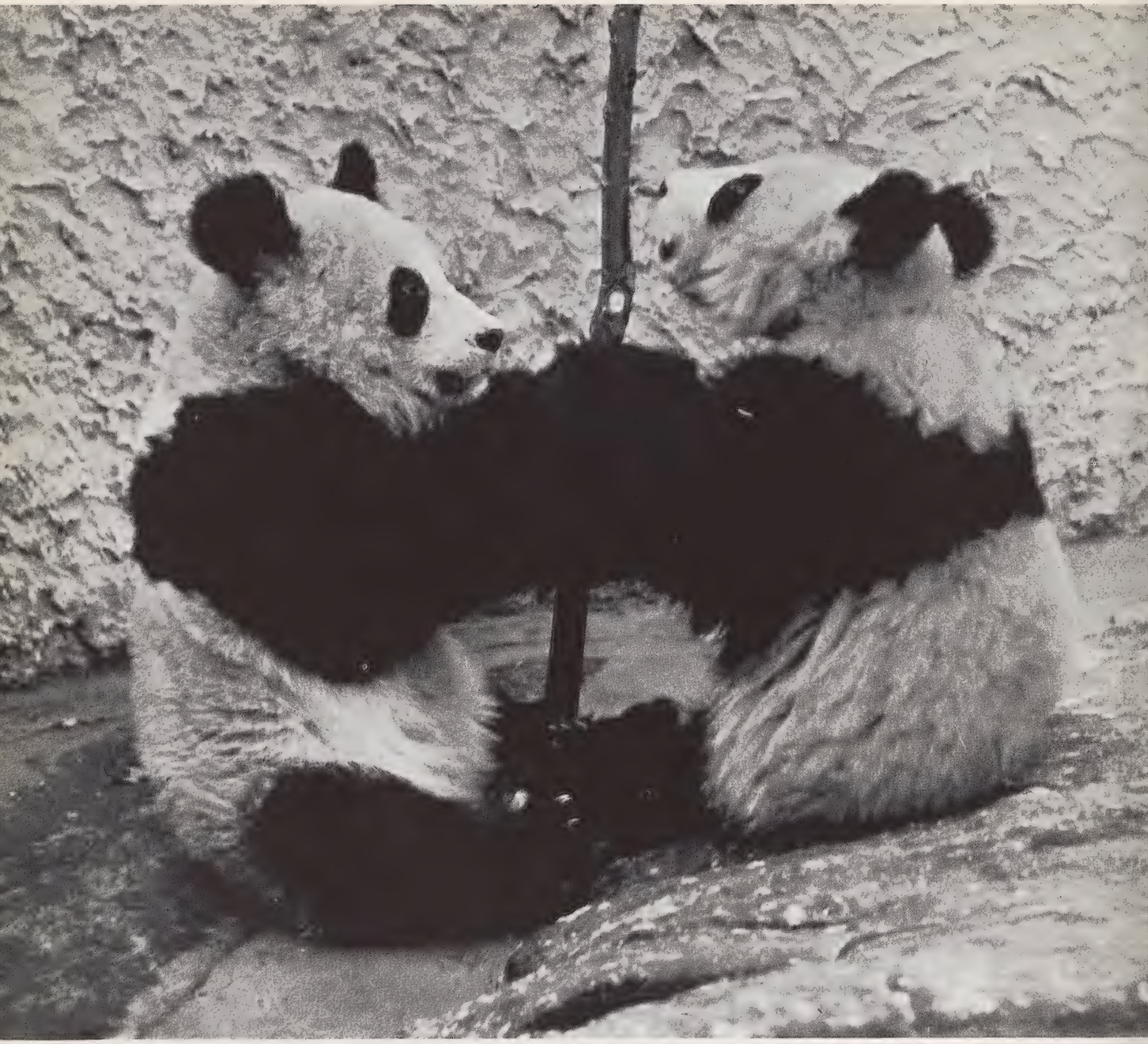
AUTHOR

Dr. David Crockett Graham, who wrote the article on the capture of our baby pandas, sent his article back by John Tee-Van "on the chance that somebody would be interested." We were!

IN THIS ISSUE

Contentment . . . . *Richard Fidler* COVER
Two Pandas – China's Gift to America . . . . *John Tee-Van* 3
How the Baby Pandas Were Captured . . . . . . *David Crockett Graham* 19
Flame-in-the-Forest . . . . *William Bridges* 24
Behind the Scenes: News and Notes 30

MAR 12 1942



Next to indolence, playfulness is the most obvious characteristic of baby giant pandas. They roll and tumble during most of their waking hours, or assume poses such as this, as if debating whether to attempt to climb a sapling. One of the pandas climbed a slightly larger tree in their new home in the Zoological Park and refused to come down until after midnight.

Two Pandas—China's Gift to America

The Zoological Society's Envoy Tells the Story of His 34,868-Mile Journey to Bring the Babies to New York

JOHN TEE-VAN

THE TWO HEALTHY, black-and-white, baby giant pandas playing and tumbling on the rock ledge of their Tibetan garden home in the New York Zoological Park owe a great responsibility to the millions of Americans who will, we hope, take delight in their drolleries in the years to come.

For these baby giant pandas are the gift of one great nation to the children of another; they are a generous thought translated into happy reality by the combined efforts of many persons on two continents, by a vast amount of hard physical labor and by an incalculable sum of international good-will.

I cannot, I think, say in any words more glowing than those of Mme. Chiang Kai-shek as she presented the babies to America what these pandas mean as a link between China and ourselves. It was 4 o'clock in the morning in the newly reopened, bomb-scarred, radio station in Chungking during a program for America in which Mme. Chiang's sister, Mme. H. H. Kung, also participated.

In her low and beautifully modulated voice, Mme. Chiang said:

"Through the United China Relief, you, our American friends, are alleviating the suffering of our people and are binding the wounds which have been wantonly inflicted upon them through no fault of their own. As a very small way of saying 'Thank you,' we would like to present to America, through you, Mr. Tee-Van, this pair of comical, black-and-white, furry pandas. We hope that their cute antics will bring as much joy to the American children as American friendship has brought to our Chinese people."

I have no doubt at all that the babies will be a source of continuing delight to American children; indeed, they have already amazed and delighted thousands of visitors who have come to the Zoological Park on the milder winter days when the pandas were playing in their garden home.

They will never, I know, realize the weight of their responsibilities as bearers of good-will between China and the United States, but—irresponsible little clowns that they are—they really need no sense of obligation to spur them on. Some of the photographs accompanying this article show their capabilities as entertainers.

I am glad to be able to report that our babies are thriving. They were weighed a few minutes after they arrived in the Zoological Park on the morning of December 30; the male weighed 62.7 pounds, and the female 57.4 pounds. (The sex of the animals, incidentally, is tentative; for ease of conversation and because they differ in color pattern and temperament they were called male and female; an accurate determination will have to be made in later months).

The latest figures on their weights, as of January 30, 1942, show that the male weighs 75.9 pounds, having gained 13.2 pounds in a month, and the female weighs 66.6 pounds, a gain of 9.2 pounds in the same period.

Because they were for several weeks quartered in the tropics on their way to the United States, we have not forced them to go out of doors constantly to face the rigors of a New York winter. Normally, in their native habitat, they would encounter weather as cold or colder than that of New York, but their tropical sojourn un-

MAR 12 1942

doubtedly conditioned them very poorly against the raw, cold weather here. Consequently they have been given an opportunity to leave their sleeping shelter only on mild, bright days, and are not forced outside if they show an inclination to stay inside. As spring advances they will, of course, spend more and more time outside.

We have been extremely fortunate, too, in finding a suitable type of food for them. During my absence, a considerable volume of correspondence was conducted with botanists and nurserymen all over the United States, to find out 1. What kind of bamboo pandas eat, and 2. Where such bamboo could be obtained, in quantity, in the United States.

These investigations came to a head quickly after my return with specimens of the types of bamboo that pandas actually eat in China. Most of these were determined to be unobtainable in the United States, at least in any quantity, and the search for food was reduced finally to a source of *Pseudosasa japonica,* a bamboo that is readily taken by both pandas. Nurseries growing it for ornamental purposes were located in Georgia and Florida and arrangements were being worked out for having weekly shipments of stalks sent to us, when Harry Sweeny, Jr., of our staff, accidentally came across a large planting of this particular bamboo in a yard in Bayside, Long Island.

Pseudosasa japonica, it turned out, is quite hardy in this latitude, and a clump about 25 feet in diameter had grown from a small planting made by an amateur horticulturist some fifteen years ago. We have now made arrangements with the owner of the clump to get daily cuttings of the tender stalks and leaves, and publicity given the discovery has resulted in numerous other plantings being reported from nearby communities. So it seems that an adequate supply of a very important element of panda diet has been located.

So much for the present situation of our panda babies.

My journey of some 34,868 miles by air, sea and rail to get the pandas in China and bring them to New York started on September 25 of last year when I left New York by plane for San Francisco to take the Pacific Clipper in the general direction of China.

Crowded planes made the direct journey by way of Wake, Midway, Guam and the Philippines impossible, and it was necessary for me to go through New Zealand, Australia, the Netherlands East Indies, Singapore, Bangkok, Rangoon, Lashio and Kunming (the two ends of the Burma Road) and thence to Chungking, war-battered but unbowed capital of China, and finally to Chengtu, ancient cultural center and capital of Szechuan province, where the pandas awaited me. Newly established war regulations made the journey an endless performance of laboriously filling out documents, sometimes in sextuplicate, of supplying photographs and occasionally fingerprints.

From the beginning, the panda expedition was clouded with uncertainties. Thus, as far as the animals were concerned, all the information available when I left New York was that there was *a* panda in China, size and sex unknown. As I travelled westward, sex and size varied with each communication I received.

Thus one can imagine my surprise upon reaching Chungking to find that there were *two* pandas at Chengtu, each supposedly sixty pounds in weight, and that they were, as far as anyone could tell, male and female! The thought of a pair of pandas at the Zoological Park to interest and amuse our visitors, with potential later accretions as Nature might be prevailed upon to take its course, was too much for my covetous zoological soul. I timorously inquired of Dr. Hollington K. Tong, Vice-minister of the Ministry of Information, whether the second panda could not accompany the first. Dr. Tong relayed my request to Dr. H. H. Kung, Vice-president of the Executive Yuan. No answer came and I left Chungking by plane a few days later for Chengtu on the last lap of the journey.

After a hundred and eighty miles over low-lying clouds we darted down through dense vapor, coming to rest on Chengtu's spacious airport. A decoy plane, made of bamboo covered with burlap and canvas, was mute evidence that the long tentacles of war reached to this distant city. Wedged into a corner of a truck between big cartons of radio tubes and an aged, blue-clad man carrying three canes, I was completely immobilized as we rattled along farm- and grave-bordered roads into the city, disputing the way

A corner of the West China Union University at Chengtu, on the campus of which the two pandas were kept until Mr. Tee-Van's arrival. It was through the faculty of this university that we obtained our previous giant pandas. Dr. Graham, who captured our new babies, was until recently Curator of the University Museum.

with squeaking wheelbarrows, rickshas and heavily-laden porters.

In Chengtu, the truck disgorged passengers and freight and under the able guidance of Dr. Frank Price, baggage and I were installed in ancient rickshas and rolled out of the city to the hedge-bordered roads of the West China Union University campus. Classes had been dismissed for lunch, and the rickshas parted a wave of students of both sexes. Some were clad in the ever-present, simple, long, blue Chinese robe, others in western garments, but one boy astonished me as he strode along in a sombrero, high-heeled shoes and a cowboy shirt and pants.

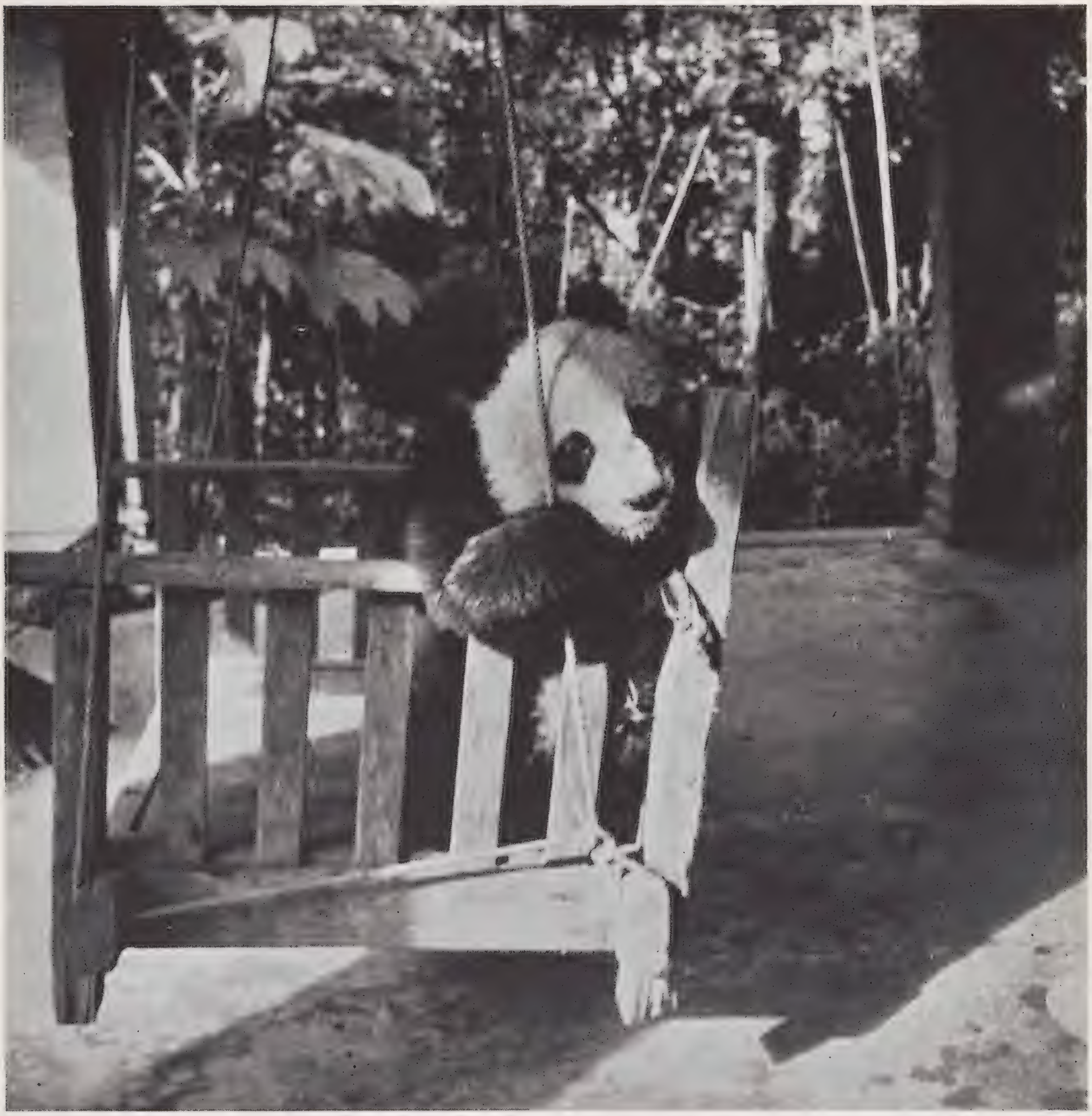
In a quiet corner of the campus we came to the gray-walled compound surrounding Dr. David Crockett Graham's house. Bamboo grew in abundance, its feathery fronds topping the walls, while lovely palmettos shaded the curving walk that led from the gateman's cottage to the house. Here, as I stumbled up steps in my excitement, was the reason for coming to China.

Under the covered porch, sitting on her haunches with paw-supported chin resting on the arm of a wooden swing, was a sleepy-faced panda calmly contemplating a small, brick-walled world that seemed to her delightfully full of friendly human beings. A memory of "Pandora" as a baby immediately came to mind and, strange to say, the two pandas may have been closely related, as they both came from near O Lung Kuan, the Village of the Sleeping Dragon. A rattle of a chain called attention to a second panda some distance away. All the uncertainties of quantity and size, but not of sex, had been resolved.

Even at first glance the different personalities and temperaments of the two animals were strikingly evident. The so-called female was coy and cuddly with a child-like desire to be as companionable as possible, while the male, more cleanly cut in color, slightly larger and more compactly formed, gave forth a very evident atmosphere of self-sufficiency — an "I'm a he-man and quite able to take care of myself" attitude.

In his article in this number of *Animal Kingdom,* Dr. Graham has described the capture of the pandas and how he brought them to Chengtu; he deserves a great deal of praise and thanks for the energy and devotion that he gave to organizing the panda hunt, and for the excellent care bestowed upon the animals while they were in his possession.

During my week at Chengtu, Dr. Graham



This picture was taken within a few minutes after John Tee-Van arrived at the home of Dr. Graham in Chengtu and after he caught his first glimpse of the pandas he had travelled so many thousands of miles to get. This is the young female. "Under the covered porch, sitting on her haunches with paw-supported chin resting on the arm of a wooden swing, was a sleepy-faced panda contemplating a small, brick-walled world that seemed to her delightfully full of friendly human beings."

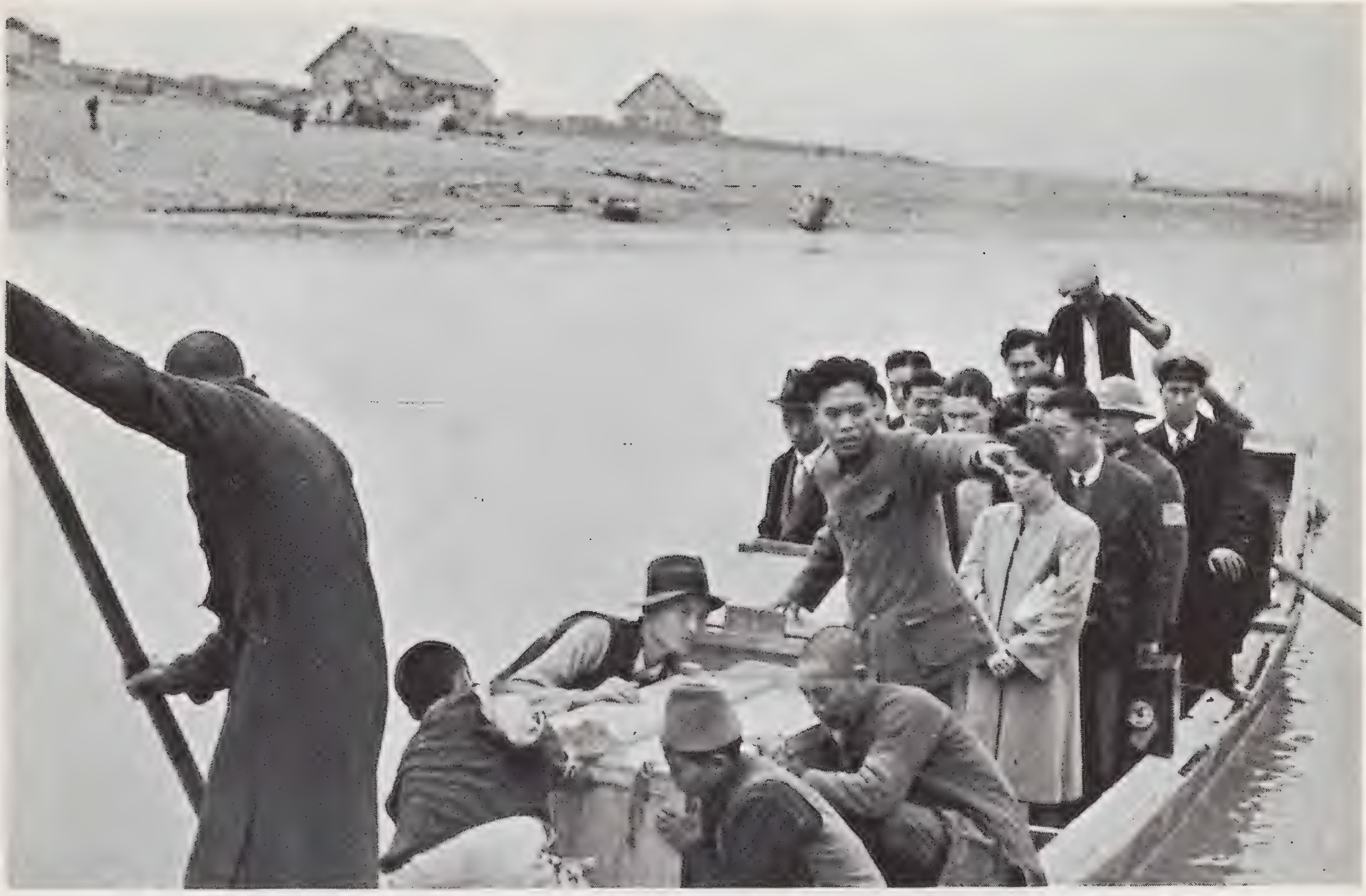
generously placed at my disposal his knowledge of pandas and of the care that should be given them, and put me in touch with everyone who had ever known a panda. Twice each day Dr. Graham and I made up the animals' food—boiled corn-meal mush with milk, honey and pablum, and saw to it that they had plenty of bamboo leaves and stems. In the meantime, the panda coolie who had nursed and helped carry the pandas to Chengtu, was sent on a three-day journey to the Wenchuan home of the pandas to secure living samples of panda bamboo, and to bring back mountain corn meal that they especially enjoyed. Incidentally, the living bamboo from Wenchuan reached America safely, and is now growing well in the Department of Agriculture's station in Maryland. This bamboo is a new introduction to America and, as far as can be determined, it is a new species.

Two days before I left Chengtu, the suspense as to the destination of the second panda was increased. A telegram arrived, saying BRING BOTH PANDAS CHUNGKING. While this was not a refusal of my request, it still might mean that the second panda would remain in Chungking or some other place in China, or that it might be sent somewhere else in the world.

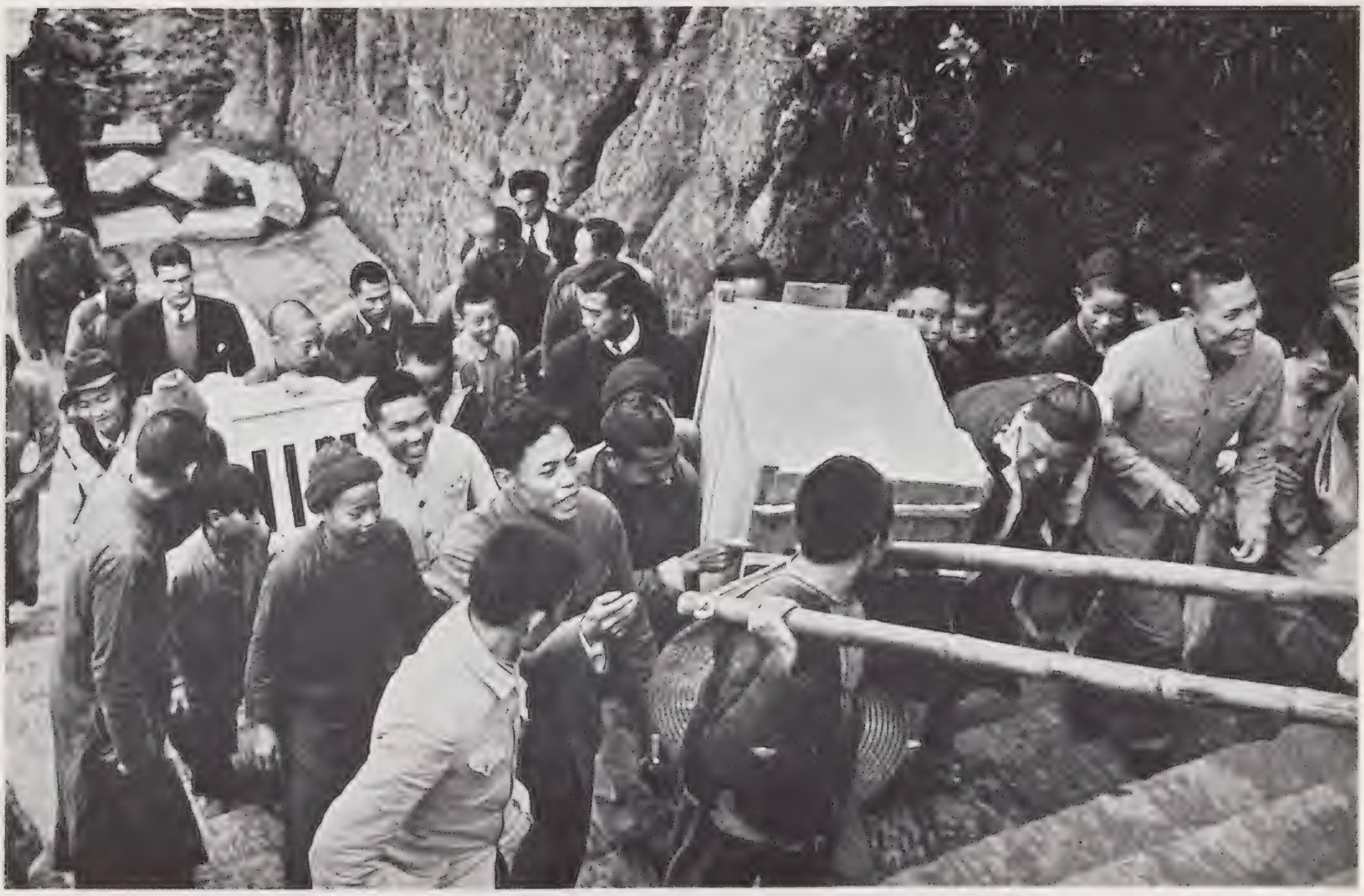
Early one morning the pandas were placed protestingly in their cages, which were built just large enough to slip through the doorway of a Douglas DC2 or DC3 plane, and taken, together with tightly-wrapped bundles of bamboo food and other baggage, through the thronged streets of Chengtu to the airfield. At the border of the city, police and soldiers stopped us, but one glance at the pandas' "passport" sped us on our way.

An uneventful air journey, over partly cloud-obscured terraced fields and hills, during which the pandas were completely composed in their cages, brought us to the flagstoned runway of the mid-river island airport of Chungking. Excitement, which was placidly accepted by the pandas, encompassed them from here on; they

Dr. Graham and Mr. Tee-Van inspect the second baby panda, the male, whose status was still undetermined. Through United China Relief, a gift of one panda had been arranged; two were captured, and Mr. Tee-Van confesses that "the thought of a pair of pandas at the Zoological Park was too much for my covetous zoological soul."



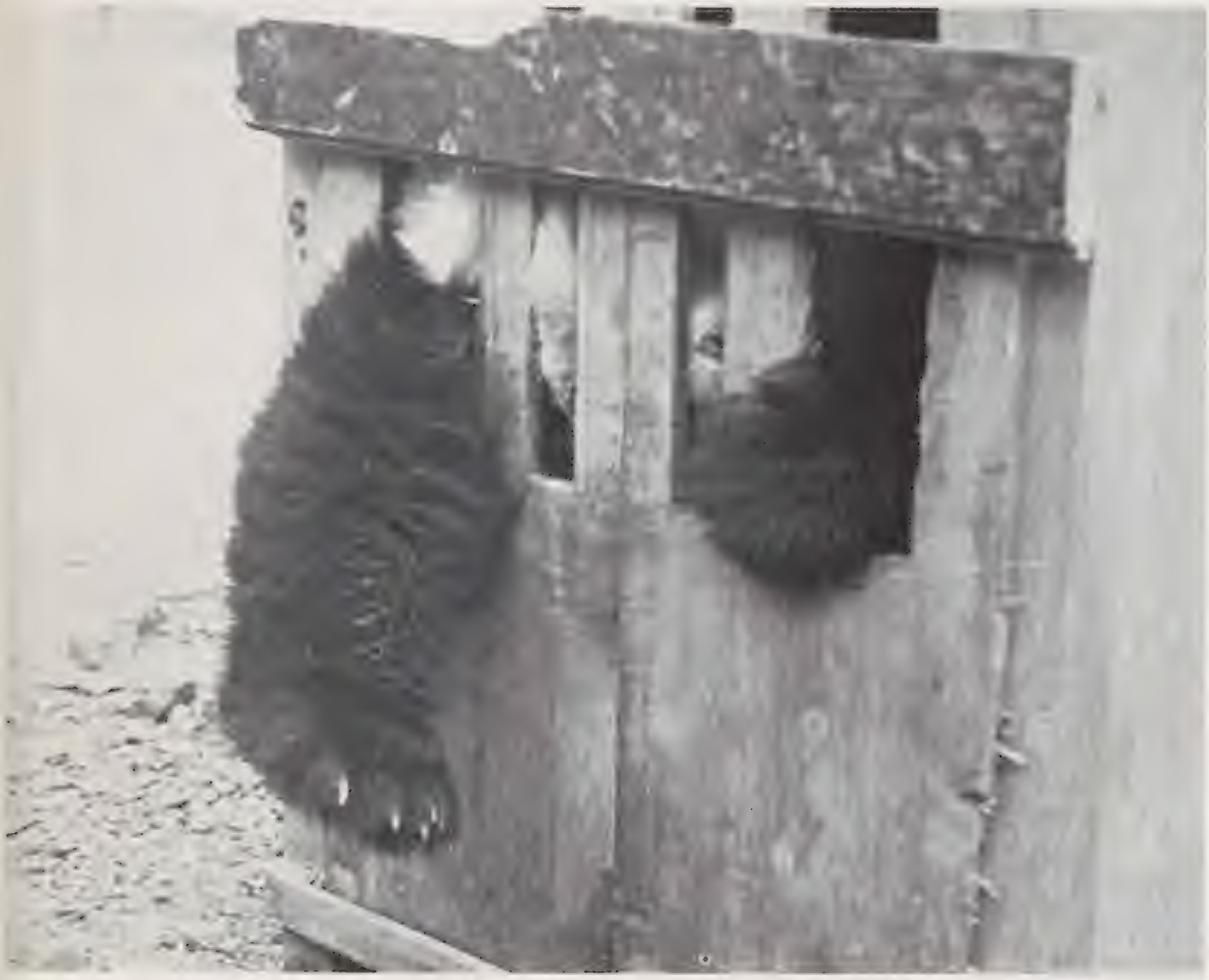
The pandas cross the Yangtze from the mid-river airport at Chungking, on their way to the capital city. In the center of the boat, pointing, is Jimmy Wei, a young Chinese who solved all sorts of panda transportation problems.

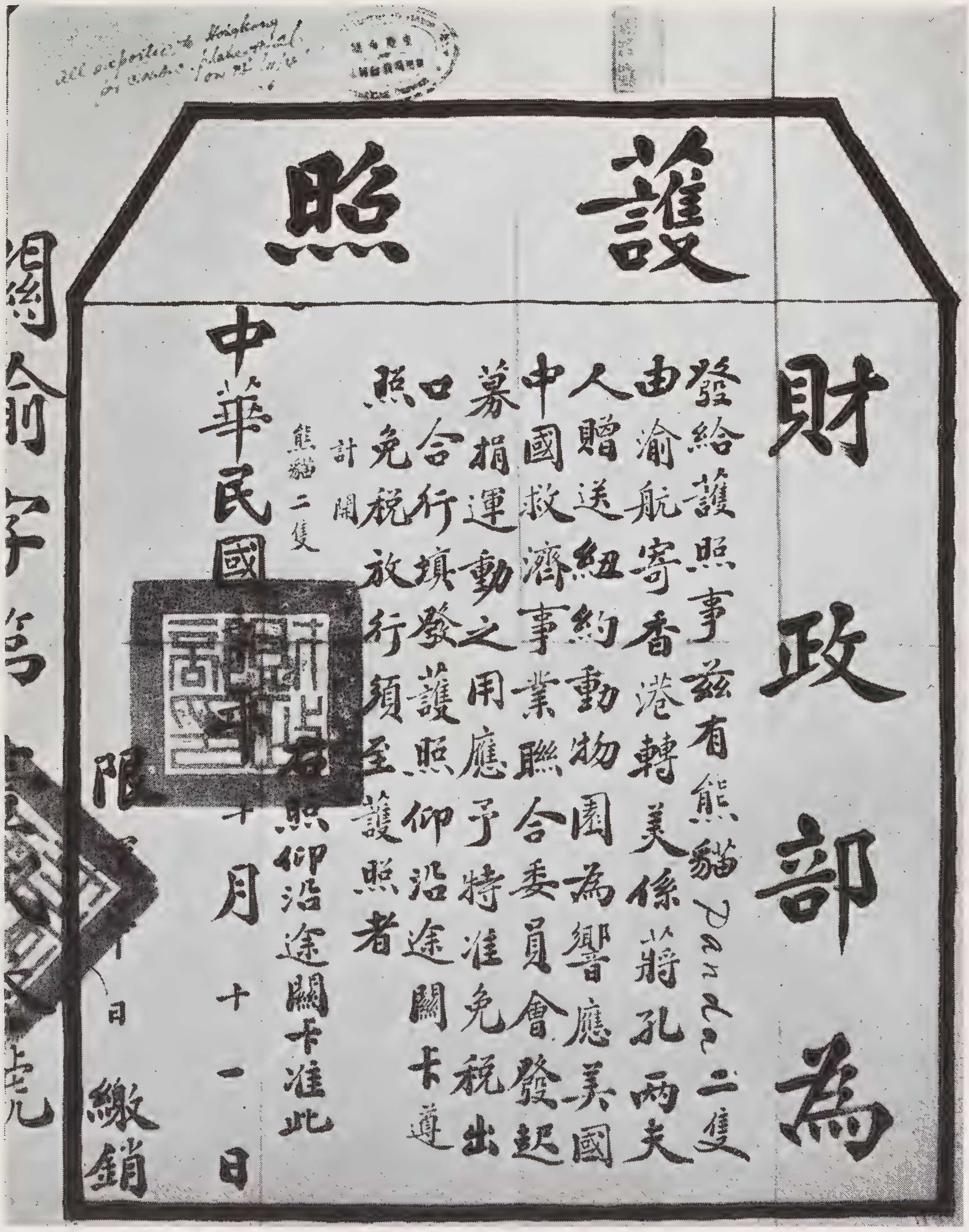


There are 324 stone steps from the Yangtze-Kiang to the Lin Sen Road in Chungking and here the pandas are being carried up from the river. In China, as everywhere else, small boys are always attracted by excitement.

(Right). News photographers were waiting at Chungking to greet the baby pandas and it was lucky that they were not camera-shy, for photographers recorded almost every phase of their journey to the United States.

(Below). A picture that speaks for itself—especially the unsheathed claws on the foreleg and the stout board nailed across the door of one of the travelling cages. At every major stop the pandas were allowed out of their boxes for play and exercise.





護照

財政部為

發給護照事茲有熊貓 Panda 二隻
由渝航寄香港轉美係蔣孔兩夫
人贈送紐約動物園為響應美國
中國救濟事業聯合委員會發起
募捐運動之用應予特准免稅出
口合行填發護照仰沿途關卡遵
照免稅放行須至護照者

計開 熊貓二隻

右照仰沿途關卡准此

中華民國 十月十一日

限 日繳銷

The giant pandas travelled on a passport of their own, a large and really imposing document that instructed all and sundry to recognize them as gifts of the Chinese Government. Many times Mr. Tee-Van and his charges were stopped by police and soldiers, but in each case a glance at the panda passport sped them on their way.

were far from their secluded native mountains, in a world where newspaper photographers, reporters and interested humans were rampant. As the plane came onto the runway, swung over to the alighting place, and its door opened, the pandas were met by the shining nozzles of cameras. To the accompaniment of whirring film and clicking shutters, they were rapidly cleared through the customs, placed on a sampan, ferried across the Yangtze-Kiang, and shouldered by coolies up the 324 steep stone steps to the Lin Sen Road.

Dozens of Chinese clambered over each other to obtain a brief glance at a *hsiung maou,* or cat bear, as the cages were placed in a motor car. An over-zealous panda-admirer had to be hauled out of the station-wagon's window. Others scampered after the car as the pandas left for the house of Dr. Bertram Rappe. Here, in a grass-carpeted, flower-bordered compound, the pandas lived happily, each fastened to a small tree next to the open box into which it could retire at will.

During the pandas' stay in Chungking they were visited by thousands and it was necessary to have three policemen on constant duty to control the crowd and guard the pandas. Only a dozen or so visitors had ever seen a panda before, for in China pandas are as little known as they are in America. The smaller panda, in turn, visited the Generalissimo's home where with great deliberateness she lay on her back and calmly munched bamboo while being admired by China's great leader.

In the world outside of China, international tension was increasing; travel reservations were limited and uncertain. To cope with this difficulty it was decided to go to Hongkong and thence to Manila as soon as possible so as to make certain to secure steamer passage to our west coast. An eastward air passage had long been impossible.

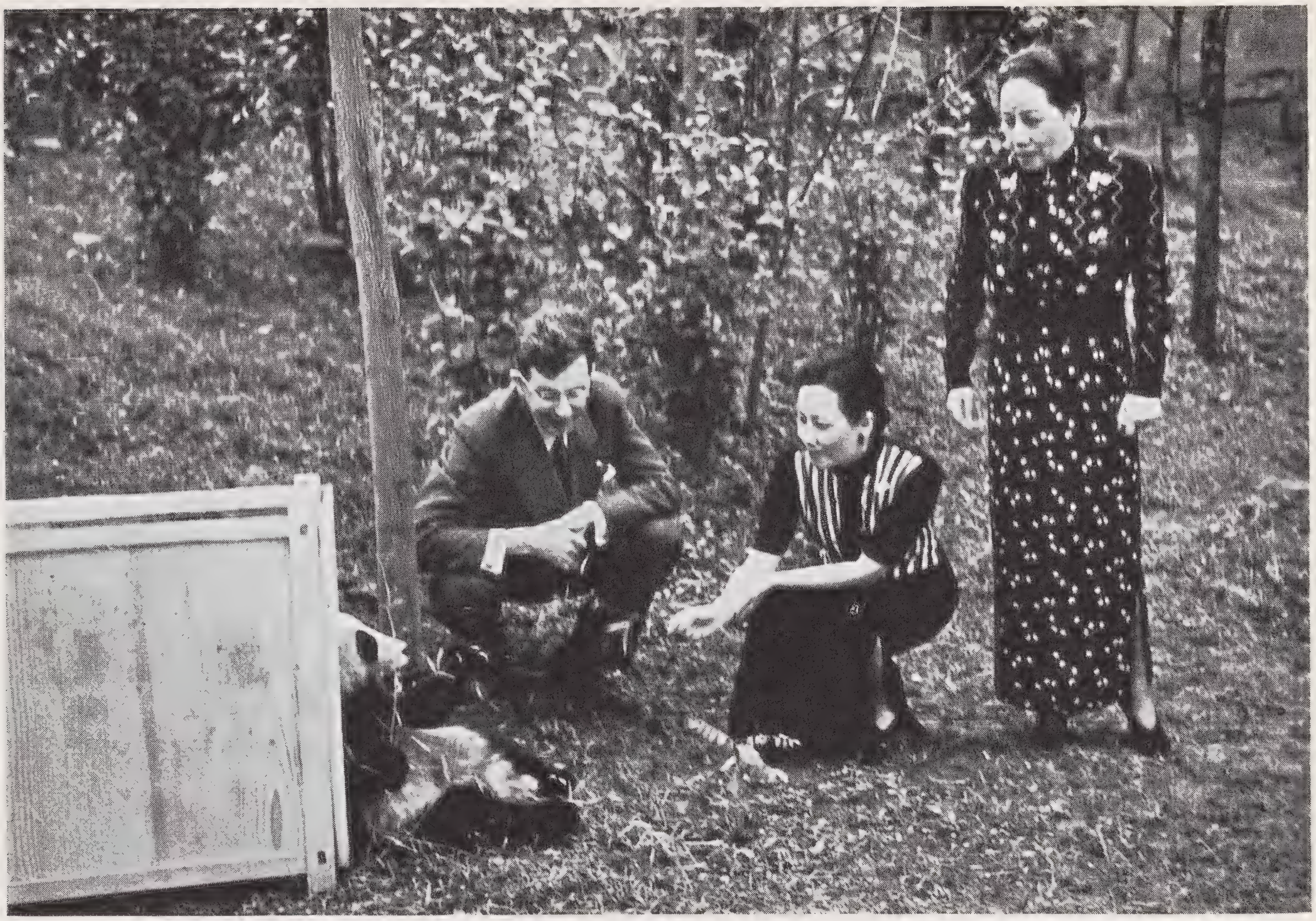
The destination of the second panda still remained uncertain, and it was only a day before Madame Chiang's and Madame Kung's broadcast that my covetous anxiety was relieved when I received word that *both* pandas were to go to New York. As I looked at the two babies and realized that both had been placed in my care, a sudden cold wave of apprehension went over me. These two pandas must reach New York safely, no matter what happened; and as I hastily reviewed my responsibilities I felt much as Dr. Dafoe must have when at last he rested and contemplated the recently arrived quintuplets.

In mid-afternoon on November 14 the pandas were again put into their cages and taken to the Chungking airport. With a boxed clump of living bamboo and four bales of compressed bamboo food, they were loaded into the passenger door of a transport plane, the boxes tied down so that if the plane hit an air-pocket the cages would not be hurled about. With a roar of propellers we started on the 770-mile hop to Hongkong. The male panda resented being in his cage and utilized the chain that was fastened to his collar as a marvellous means of showing his distaste for confinement. Every few moments a rattling crash heralded the fact that with a sweep of a paw he had hurled the end of the chain from one end of the cage to the other. And every few minutes my fellow passengers cringed before a mental image of the animal breaking loose. Each time that the noise occurred I expected to find that the loose end of the chain had wrapped itself around the panda's neck and that a choking animal would result. So with a flashlight in the dim afterpart of the plane I would cautiously open the cage door and peer inside, once to find that the panda had produced a variation in his method of making noise. He was picking up the chain in his mouth and dropping it on the floor! Another time a damp black nose shoved its way out of the crack of the door, and as I pushed the objecting animal back, his claws scratched my hand. When I went back to my seat, applying iodine to the wounds, a Marine Corps major asked if I had had anti-tetanus injections. I said "No." Thereafter, I had a couple of dreadful hours as my imagination played tricks with me. I could feel my jaw slowly but surely turning to granite!

Our two New York pandas have violated a panda airplane tradition: They did not break out of their cages and bite a pilot! Everywhere I went the same story came forth, embroidered endlessly with details as to how one or another of the pandas that have flown had escaped from its cage or loosened its collar or chain, stalked up the aisle past gaping, astonished passengers, and with determination and unerring accuracy found the pilot (never the co-pilot), grasped the former about the legs and tore his trousers! Perhaps our animals should have been allowed to accomplish what apparently is part of any self-respecting airplane-riding panda's education, and I hope that panda psychiatrists will not reproach me for refusing to allow these juveniles to express themselves.

As night came on and the sun went down behind jumbled mountains, the pandas quieted down, and at last I could enjoy the thrill of flying in the dark in a blacked-out plane over China. Here, unlike America, headlights of motor cars did not stab the night and air-beacons were non-existent; below in the velvety purple-black only a small orange charcoal fire or a lantern in a hamlet showed that man still existed. Fantasies crept in: the tip of the plane's wing, held steady by the automatic pilot, loomed black in the darkness and was constantly mistaken for a mountain mass on the far horizon. A bright light below us, moving at our rate of speed, produced considerable alarm, until with amusement I realized that it was only the brilliant reflection in flooded rice fields and rivers of Venus, the evening star.

Five hours and twenty minutes after leaving Chungking, the red and green running lights at the tip of the plane's wings were turned on, and we realized that in the darkness high above the earth we had crossed the Japanese lines, and that blacked-out Kowloon and Hongkong must be below us. A small illuminated patch surrounded by rubies beckoned to us and we slipped down into Kowloon airport, the field blackening again as we taxied to the hangar.



The two gracious ladies of China by whom the giant pandas were presented to America—Mme. Chiang Kai-shek (kneeling) and Mme. H. H. Kung, her sister. At Chungking they both paid several visits to the pandas, and the female panda, in turn, made a call on Generalissimo Chiang Kai-shek and behaved beautifully during his inspection.

Despite a taxi and motor strike, eager helping hands moved the pandas to specially prepared, carefully disinfected quarters at the animal hospital of the Society for the Prevention of Cruelty to Animals. By midnight they had calmly devoured their supper and after an exciting day, had gone to sleep. Leaving the animals safely in their quarters, we crept through the unlighted streets of Kowloon. Now and then a pale blue beam from a flashlight would be thrust into the car as an air-raid warden made certain that we were on legitimate business. After twenty minutes of groping through the streets I was deposited in a pitch black room of unknown quality, uninformed as to whether I was in a hovel or in respectable quarters, only to wake up the next morning in the excellently appointed Peninsula Hotel with a superb view of Hongkong Harbor.

A day later, pandas, bamboo and luggage went back to the airfield, which was soon to be bombed and captured by the Japanese, and were loaded on board the Hongkong Clipper for the 758-mile journey over the China Sea to Cavite and Manila in the Philippines.

Hongkong marked the border line of panda safety as far as temperature was concerned. The heat of the tropical Philippines and the unknown temperatures of the steamer voyage were something to be worried about when one considered the panda's dense coats of heavy fleece-like fur and remembered their cool mountain home in western China where they had lived at elevations of seven to twelve thousand feet.

To cope with the heat problem, word had been sent on ahead asking for assistance and when the pandas disembarked at Cavite, three places were suggested for them: an air-conditioned room at Manila, which was refused as the pandas would have to be brought out again into hot weather and the sudden shock might be too great for them; Baguio, 6,000 feet high and 400 kilometers away, which would have been ideal except for its distance from Manila and the necessity for being in close touch with steamer agencies; and finally Tagaytay, 2,200 feet high, and 60 kilometers from Manila, where quarters for them and for me were found on the ridge of Taal volcano, overlooking an enormous crater lake and the Straits of Mindoro.

At Tagaytay the pandas lived happily in relatively warm temperatures which were, however, ten to fifteen degrees cooler than at Manila. Their feeding schedules were adjusted so that they slept most of the day, but as their activities were thus principally confined to the night hours, it meant that my sleep rarely lasted more than an hour or so at a time. Again visitors crowded around these strange animals, the first ever to come to the Philippines, and the Philippine Constabulary kindly sent officers to guard and protect them.

Much to my surprise, suitable bamboo in quantities sufficient for a steamer voyage of indeterminate length was difficult to find in the Philippines, and it was only the day before leaving the islands that large enough quantities of the right kind were secured. It must be remembered that the diet of pandas in their native habitat is almost exclusively bamboo, and with this in mind strenuous efforts were made during the trip to maintain abundant fresh supplies of this plant. Different species of bamboo vary greatly in their capacity to remain unwilted after cutting. Thus the bamboo from Dr. Graham's compound at Chengtu remained fresh for over five days, even though not especially cared for, while that brought from Chungking wilted in a day. Hence, when the pandas arrived in Tagaytay, the cry for fresh bamboo was loud and insistent, at least as far as I was concerned. A gardener rushed out and hurried back with a few stems of bamboo which the pandas immediately consumed with that self-satisfied complacency that only these animals can assume. The pandas in their acceptance of this bamboo showed excellent national bias, as the plants were an ornamental variety introduced from China. A visit to the clump a day later clearly demonstrated that there might be enough bamboo to last during the Philippine visit but not enough for the steamer voyage. Hours and days were spent searching miles of road and countryside around Tagaytay for more bamboo of this species, but without success. Other bamboos were tried but the pandas refused them. Sometimes the plants had to be rejected because they were in situations where road dust had contaminated their leaves, or else they had spines that might injure throats and digestive systems. As a last resort a sample of the ornamental bamboo was taken to Dr. Hilario Silayan, Director of Plant Industry at Manila. This gentleman gave immediate assistance. Botanists were called upon and the bamboo identified. Records were searched and large quantities of Chinese bamboo were reported at Lamao, 150 kilometres from Manila. Dr. Silayan kindly offered to have five carefully-wrapped bundles of this bamboo delivered to the steamer's refrigerators on the sailing day, November 25. All our bamboo difficulties apparently had been conquered.

On November 24 I was informed that the steamer would not sail on the twenty-fifth, but would leave two days later. I hurried to Manila to ask that cutting of the bamboo be held off for two days, and there I was greeted by Dr. Silayan with: "I have bad news. All of that panda bamboo was destroyed three weeks ago. But I have men at Los Banos trying to find some more."

There was no way of getting in touch with the men by telephone to postpone the cutting, so I drove 95 kilometres to Los Banos only to find that the bamboo supposedly at that place had been transplanted months before, and that the men were 30 kilometres further on, still searching for the elusive panda food.

Rushing on even more hurriedly, we found their truck in the little village of Nanghaya, the men busily cutting bamboo and tying it into bundles. But the bamboo was not the right kind, although the men insisted that it only seemed wrong and that it was actually the same as the sample, merely having altered in texture and size because of trimming and cutting. I persuaded them to stop cutting and suggested that I take some of the stems and fronds to the pandas and see what *they* thought of it.

At Tagaytay two hours later, when I offered the sample to the animals they turned up their noses in obvious disgust. They were better botanists than the men. In despair, I realized that the search for bamboo must start all over again.

Late the next day, after searching diligently and inquiring for ornamental bamboo in many villages, I was dejectedly returning to the animals at Tagaytay. Half a mile from the pandas' home I saw a clump of bamboos exactly like those the pandas were feeding upon! The clump had obviously been planted as a decoration for the gateway of the nursery garden belonging to the as yet non-existent city of Tagaytay. But time was precious and in order to speed matters I decided that the head man of the city, the mayor, should be approached. I found him in the little building that functioned as City Hall and poured the sad story of the pandas' bamboo into his receptive ear. The reputation of the little animals had spread rapidly and the mayor immediately wrote a letter to the forester in charge of the nursery, instructing him to cut his ornamental bamboo and do everything possible to expedite the filling of our depleted food supply. Rushing back to the nursery we found the forester and pressed the Mayor's letter into his hands. His first reaction – for he was an appreciative forester and gardener and evidently thought highly of his gateway bamboo – was to be rather sad at temporarily losing an old, gracefully-spreading friend, but his humanitarian or pandatarian impulses impelled him to reluctant consent to cut down the clump. Just as the machete was about to bring down the stems, the gardener's face lit up and he said, "Come!" Leading us down paths to a ravine, he pointed to five large clumps of the same bamboo, uncontaminated by road dust and in quantity sufficient to feed ten pandas! "Take all you want, my gateway bamboo won't have to be touched." So our Philippine bamboo troubles were solved and five large bundles of bamboo were stored deep down in the ship's refrigerators.

On November 27, early in the morning before the intense midday heat asserted itself, and ten days before Japan attacked Hawaii, the pandas boarded ship at Manila to begin their long journey across the Pacific – a journey lengthened far beyond its ordinary duration, in the course of which they crossed the equator twice, a distinction enjoyed by no other pandas. Just where they went cannot be told, as censorship imposed by war conditions steps in.

On shipboard the pandas lived on the upper deck where breezes blew and where they could be kept as cool as possible. During the daytime they were under a canvas shelter that the captain had installed for their comfort. Here, fastened to their travelling cages, they played together and slept and devoured their corn meal mush and bamboo. Except for the first four days out of Manila, when they almost died of heat and an intestinal disturbance, their health was perfect. Probably the only thing that kept me from jumping overboard in despair during those four days was the fact that I would have to write a telegram saying that the animals were ill or had died and I could not find the proper words.

The routine of caring for the animals was an exacting one, keeping me busy with one task or another from 5:45 o'clock in the morning until 9:30 or 10 o'clock at night, after which the pandas were locked in their comfortable inside cages and slept or roamed about as they pleased.

Midway of the voyage to Hawaii war began, and camouflaging of the ship was immediately started. The chief officer threatened to camouflage the pandas, for he asserted that their black and white coloration was entirely too conspicuous. This joking threat almost materialized, for an unwary sailor-painter came too close to the male panda and I came out of the inner cages one day to find the animal clamped around the leg of the sailor – who was holding a paint pot in one hand and a brush in the other, both of them high above his head, while at the same time he was yelling for help. During the ensuing excitement the sailor's trousers were torn, the panda was daubed with paint in half a dozen places, and subsequently I was bitten and scratched while making certain that no iota of paint remained on the animal.

During our brief stay at Hawaii fresh bamboo was obtained from the experiment station of the Hawaiian Sugar Planters Association, but all that remained of this had to be destroyed at San Francisco before we were allowed to land – the introduction of possible pests being thus rigidly controlled. At San Francisco, however, bamboo in large quantity and excellent condition was presented by the authorities of Golden Gate Park. This and other supplies were placed with the pandas in a baggage car for their long trip

AT TAGAYTAY: JOHN TEE-VAN AND ONE OF THE BABIES.

Fastened to their travelling cages, the pandas played on the upper deck of the ship as they came from Manila to San Francisco. Except for the first four days out of Manila, when the heat was too intense and they almost died of an intestinal disturbance, their health was perfect and they thrived on their corn meal mush and bamboo.

across the continent. Allyn Jennings, who met us in San Francisco, and I took alternate four-hour watches on the transcontinental journey. At Chicago the two pandas at the Brookfield Zoo, Mei-lan and Mei-mei, sent cakes with superimposed sugar-coated greetings of welcome to the newest pandas to come to America. In New York they calmly and deliberately accepted the beautiful quarters newly built for them and settled down, we hope, for a long and happy life with us. That the public will enjoy them we know, and we are sure that our pandas will enjoy their visitors.

Everywhere during the journey — in China, the Philippines, on board plane, steamer or railway train — I was bombarded with questions about the animals. Interestingly enough, the queries were almost always the same and I soon found that there were about ten basic interrogations. With this limited number of questions the answers became almost automatic and most of the panda discussions were antiphonal affairs. However, the questions do give an idea of what people want to know about these delightful harlequin animals and some of the answers that I gave are repeated herewith.

Where do giant pandas come from?

They come from a very limited area in western China which extends about 400 miles north and south and is 75 miles wide. Here they live in cool or cold temperatures at elevations of approximately six to eleven thousand feet.

What do pandas feed upon?

In the wild they subsist almost entirely upon bamboo leaves and stems; possibly other vegetable matter may enter into their diet. Our pandas are fed upon bamboo and a gruel-like mixture of boiled corn-meal, milk, honey and pablum. Other pandas have been given various vegetables, cereals, specially-made bran and whole wheat bread, ears of corn, pears, etc.

Do they eat meat?

No. Unlike the similarly-shaped relatives, the bears, pandas are entirely vegetarian. Their molar teeth are very much specialized and enlarged so that they are able to crush their bamboo food.

Which is the male and which the female?

We have not yet definitely determined the sex of these animals, and at present call them male and female principally because of their different temperaments. As pandas probably mature at about six years of age, we may have to wait until that time before we definitely know.

How old are these pandas?

Pandas are supposedly born from late fall to early spring and we thus estimate that these animals are about a year old. During the trip from China both animals lost the last of their baby teeth.

What age do they attain?

No one knows, as pandas first came into captivity six years ago and we have no records beyond this.

Are they common where they come from?

We know so little about pandas in the wild that it is very difficult to say. The country that they inhabit is difficult of access and few competent observers have been able to check on their abundance. They are usually considered to be rare. A brief history of pandas, which indicates how uncommon they are, follows: The animal was first discovered in 1869 by Père David; the animal was first seen alive by a white man in 1916; it was not until 1929 that a panda was shot by a white man, when Theodore and Kermit Roosevelt secured one; and the first one in captivity was Su-lin, who was brought from China in 1937 by Mrs. Ruth Harkness.

Why are they called giant pandas?

They are called giant pandas to distinguish them from their smaller relative, the lesser panda, a fox-like and raccoon-like animal which for many years was known simply as the panda. The meaning of the native name panda is unknown to me; it is a native Nepal name. In China the native names of the giant panda are *hsiung-maou* (cat-bear), *pei-hsiung* (white bear), *hua-hsiung* (speckled bear) and *ho shien* (monk).

Did these two animals come from the same place?

No, the two pandas came from opposite sides of a mountain range, and are probably not related.

How big will they be when they grow up?

Male pandas grow to about 350 pounds, while the females probably reach 300 pounds. The foot-long panda dolls that are so popular nowadays, have produced a false idea in many people's minds as to the size that pandas attain. Many persons, upon viewing our animals when they weighed about 60 pounds, expressed surprise that they were so big, and when an animal of 300 pounds or more was mentioned, they were astonished.

Are the pandas vicious and do they attack men?

The animals when small are not vicious, although large ones in captivity may become so. The small ones can bite and scratch quite badly when they play. Their coats are so dense and thick that their own playful bites make no impression, but an unprotected human may fare badly when playing with even a relatively small panda.

In the pandas' home country, however, the natives consider them harmless and call them *ho shien* or the "monk (religious) among bears," as they are vegetarians and do not molest humans or their corn fields. In other words, the giant panda is a gentleman and stays in his own back yard!

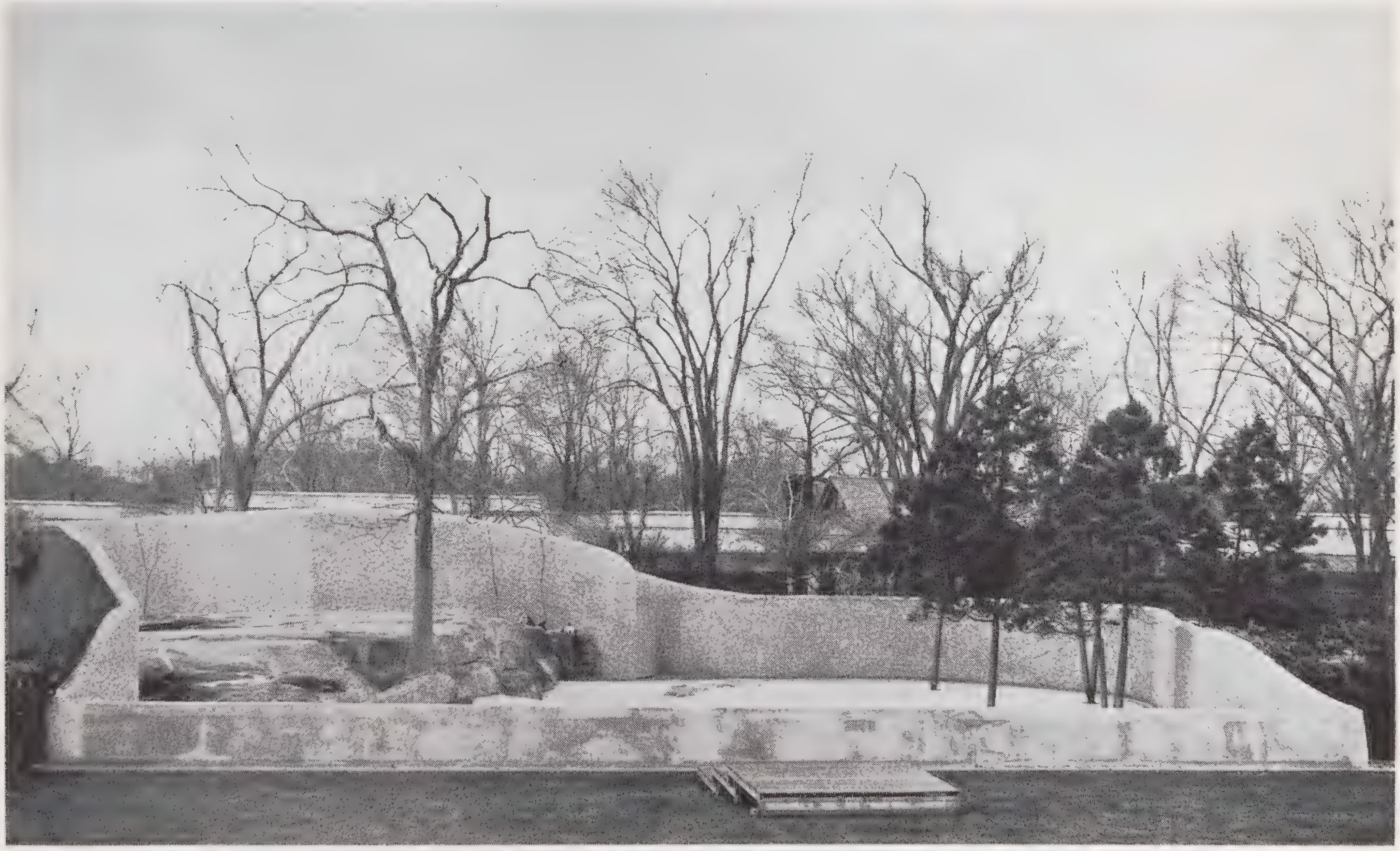
* * *

We hope, in the years to come, that our pandas will provide specific answers to many more queries. Meanwhile, they are growing rapidly and some of their baby traits are rapidly vanishing, even though pandas retain their baby play for an astonishingly long time. We know that they will amuse and interest our visitors, and we trust "when the war is won" that the two gracious ladies of China who presented the pandas to us, will come and see the animals in their new home.

* * *

The Zoological Society owes a debt of gratitude to many in China and elsewhere for their assistance in securing and transporting the pandas: to Mesdames H. H. Kung and Chiang Kai-shek who gave them into our stewardship for the people of America; to Dr. H. H. Kung, Vice-president of the Executive Yuan and Finance Minister of China, who made it possible for the pandas to leave China; to Mr. and Mrs. Henry Luce who, while they were in China and at the cabled request of Allyn R. Jennings, then General Director of the Zoological Park, asked if pandas could not be sent to America; to Dr. Hollington K. Tong, Vice-minister of the Ministry of Information, who with capable understanding took care of my many difficulties; to Dr. David Crockett Graham who went into the panda country and secured the animals, and to Mrs. Graham who opened her house to the Society's representative; to Dr. Frank Price of Chengtu who night and day surmounted impossible obstacles for me; to Melville Jacoby of *Time* and *Life* and Mrs. Jacoby (Annalee Whitmore) of United China Relief, who worked ably and unceasingly for the success of the panda trip; and to the many gentlemen in China, the Philippines, Hawaii and in America who aided in securing the vitally necessary bamboo for the baby pandas.

Particular thanks should be extended to Douglas Auchincloss, Otis Swift, Raymond Rubicam and other officials of United China Relief, through whose basic efforts the pandas were permitted to come to us, and to Dr. Charles E. Stuart of Ventura, California, whose short-wave listening post caught and transmitted to the Zoological Society and United China Relief many lengthy and informative broadcasts about the panda expedition.



At home in the New World: the giant pandas at the end of their journey, in the habitat built for them in the New York Zoological Park. Here, in surroundings simulating the compound of a Tibetan monastery, they have plenty of room to play, and a pool and a waterfall for bathing. Their sleeping quarters are hidden behind the rear wall.

How the Baby Pandas Were Captured

Luck Was with the Hunting Party that Scoured the Mountains Around Ts'ao P'o in Western China Last Fall

DAVID CROCKETT GRAHAM
West China Union University

EARLY last summer I was informed that leaders in the Chinese Government wished to secure a live giant panda which Mme. Chiang and Mme. K'ung would present to the American people in appreciation of their gifts to China through United China Relief. I was asked to do what I could to get a panda.

I therefore wrote to my old friend, Den Wei-han, a Chinese ex-preacher whom I had previously employed to collect mammal skins through native hunters, and asked him to get the hunters to search for live pandas. He engaged two groups, one at Wei Chow and one at Ts'ao P'o, and advanced $500 (Chinese currency, equivalent to $27 American) to one and $200 to the other.

Before describing the search which resulted in the capture of two baby giant pandas, I should perhaps explain that the range of the giant, or white, panda is in a district about 75 miles wide and 400 miles long, between Songpan on the north and Ningyuenfu on the south. The animal lives in the mountains between the altitudes of 7,000 and 10,000 feet. Its legs are so short and its body so shaped that it may easily, with the assistance of its claws, climb trees and steep mountains. It is a cold-weather animal; in its home the weather is cool in summer and cold in winter. Nevertheless it does not hibernate.

In these high, rugged mountains of Sikong and western Szechwan are found five of the world's rarest animals—the giant panda, the lesser panda, the golden-haired monkey, the takin and the serow. Of them all, the giant panda is the rarest and the most interesting.

Because it is so rare, the Chinese Government has placed a strict prohibition on the killing or capture of white pandas, but despite this prohibition the killing goes on. A hunter far off in the mountains sees a white panda and kills it for its meat and hide, knowing that the government officials probably will not hear about it. Or a hunter or wood-gatherer accidentally finds a baby panda and tries to rear it at home, where it dies in captivity because of poor nourishment. The restriction on exportation is justified, but the danger of extinction comes not so much from exportation to foreign countries as from the killings by native hunters.

The white panda has been known for centuries by the Chinese. During the Manchu dynasty skins of this animal were sent as tribute to the government of China by the aborigines of western Szechwan and eastern Tibet. The first foreigner to discover the panda was Père David who in 1868 secured a skin and some bones at Mupin and sent them to a French museum. Kermit and Theodore Roosevelt were the first foreigners to kill a giant panda, which they did in 1929 near Ningyuenfu. It was in 1937 that Mrs. Ruth Harkness took the first live panda to the United States, and subsequently Tangier Smith has taken several to the United States and Europe.

My interest in giant pandas began in 1929 after the expedition of the Roosevelt brothers into Tibet and western Szechwan. In the following summer I went on a collecting trip to Mupin, used some of the hunters that had accompanied the Roosevelt expedition, saw plenty of panda tracks and purchased a panda skin from a native hunter, but did not succeed in killing a panda. In later years I secured about fifteen panda skins with bones, all of which are in the U. S. National Museum.

In 1938 Dean Sage, Jr., requested Prof. Dick-

Some of the hunters who left their farms and took up the search for giant pandas at the request of Dr. Graham. At one time last fall more than seventy hunters and forty dogs were scouring the mountains—the largest panda hunt ever organized at one time, and certainly one of the most successful, since two baby pandas were captured.

inson of the West China Union University to get a live giant panda for the New York Zoological Park. At that time I was employing Den Wei-han as a skin collector and one day he reported that in the mountains near Mupin a baby white panda had been caught. Since I was not empowered to collect live mammals for the Smithsonian Institution, I allowed Den Wei-han to get the baby for Prof. Dickinson. At first the panda — the famous Pandora — refused to eat, but I taught it to eat its food and then turned it over to Prof. Dickinson and eventually it reached New York. Later Den Wei-han secured a second panda — the animal known at the New York Zoological Park as Pan.

Such was my background of knowledge of giant pandas when I was asked to try to get one for the people of America.

After writing to Den Wei-han, I went to the panda country myself between July 17 and August 24 and assured myself that the hunters actually were searching. Indeed, they caught one live panda, but it fought loose and escaped.

On September 8 I was informed that the panda for America was wanted in October. I was urged to return to the highlands and bring back a panda immediately. I replied that it was very difficult to secure a panda at this season of the year and in so short a time. It had never been done before and sometimes it had taken several months to capture a live panda.

Summer is, of course, the poorest time of the year for hunting wild animals in the highlands of west China. The leaves are on the trees and the underbrush and it is very easy for the animals to hide. Moreover, the hunters are all farmers and during the summer and early fall they are very busy caring for and harvesting their crops. In the latter part of October the leaves begin to fall, the snow creeps further and further down the mountainsides, and the animals can easily be tracked in the snow. The men have leisure to hunt, too, and gladly do so in order to supplement their family incomes.

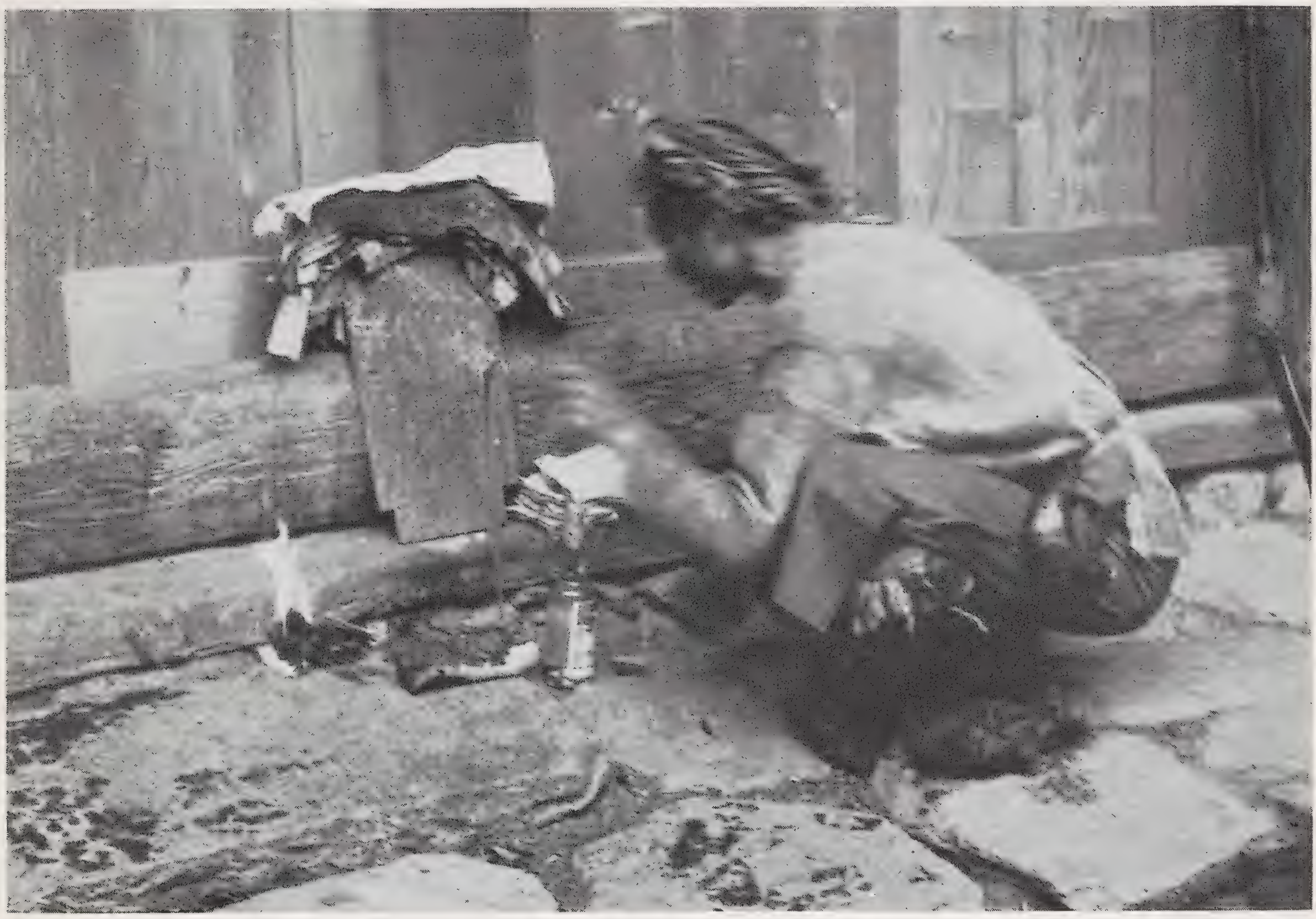
However, I agreed to return to the highlands and to do my best.

On September 10 I again started for Wen Ch'uan. I took plenty of bedding but no food, for I planned to live off the land. With a servant, Mr. Li, who acted as cook, carrier, messenger and general helper, I went by bus to Kuanshien and stopped for the first night at Yu Ch'i. On the afternoon of September 12 I reached Wen Ch'uan and sent a messenger hot-footed to fetch Den Wei-han, who arrived early the next afternoon. We got in touch with the two bands of hunters who had been working during the summer and offered them a big financial reward for success, urging them to redouble their efforts.

The next day Den Wei-han and I went to Ts'ao P'o, the natural center of a great panda region. On the way we crossed the Min River on a bridge consisting of 17 bamboo cables, and crossed another mountain stream on a rope bridge of a single bamboo strand. We arrived at our destination nearly two hours after dark.

At Ts'ao P'o we engaged five other groups of hunters and sent them into the mountains. It should be emphasized that these hunters left their work at a very busy time and received no wages. They were simply offered rewards if they should capture live pandas. More than 70 hunters and 40 dogs were at work in seven or more bands in at least seven different localities. This was the biggest panda hunt ever organized at one time.

When the Wa Ssu aborigine hunters of the Ts'ao P'o region go to the mountains to hunt they take no bedding, no food but corn meal and salt, and no rain clothing. With their dogs and guns they hunt until dark in the wild, uninhabited forests on the steep mountainsides. If



A prayer is being offered to Mei Shan, the god who helps the hunters capture wild animals alive. Mei Shan was, of course, the patron deity of the panda hunt. The god is represented by the flat slab of stone against the wall and an offering of meat and wine is being made to him. This ceremony took place just before the panda hunt started.

"There were many difficulties to overcome," Dr. Graham comments about the transportation of the pandas. This mountain stream was one of them.

they happen to find a natural cave or shelter, they sleep there; if not, they construct a shelter with branches or sleep in the open. Generally they build a fire. Sometimes the men are wounded or even killed during a hunt.

The hunters are very religious and depend on certain gods to give them success. One is the mountain god. Through worship and offerings his favor is sought, for he prevents accidents, controls wild animals and protects the hunting dogs from wild boars, leopards and bears. Wu Ts'ang, who is also worshipped by the Chinese *tuan kung,* seems to be a deified acrobat, for his image shows him standing on his hands on the back of a tiger. He loves to hunt and if for some time he is not taken on a hunting expedition he is said to knock over dishes and other household furniture. He is the patron deity of hunters when they go out to kill wild birds and animals. A third god is Mei Shan, who is represented by a flat slab of stone on which there is generally no image and on which no characters are written. He helps the hunters capture wild animals alive, so he was their patron deity on the panda hunt.

At Ts'ao P'o a group of hunters brought their god Mei Shan to the yamen and in our presence performed their ceremony of worship before going up on the high mountains in search of live pandas. They offered wine and pork to the deity, and burned candles and incense before him. Their leader prayed that they might capture a live panda soon after they began to hunt, and two more soon afterward. He promised that if the prayer were answered, they would offer to the god a chicken and a pig. In case of success, such vows are faithfully fulfilled. When the hunters are unsuccessful, however, they sometimes whip the god with sticks or in anger throw him on the ground.

During my two trips to the highlands on this hunt I took no food with me, but lived off the land. This was comparatively easy in cities and towns, but in small villages there is often very little besides corn meal and bean curd. At Ts'ao P'o no meat could be purchased except fat bacon, which was very expensive, and there was no milk, no sugar, no rice and very little fruit and vegetables. The meals were very irregular, the noon meal sometimes coming at 3:30 P.M.—and once it was omitted entirely.

One day two residents of Ts'ao P'o, who returned from a journey, informed us they had heard of a captive panda. We sent them to try to get it for us and they returned to report that while they had seen it, it had been bought by a local official, Mr. Yang. The panda was 60 miles away and could only be reached by a very rough path that crossed two precipitous mountains.

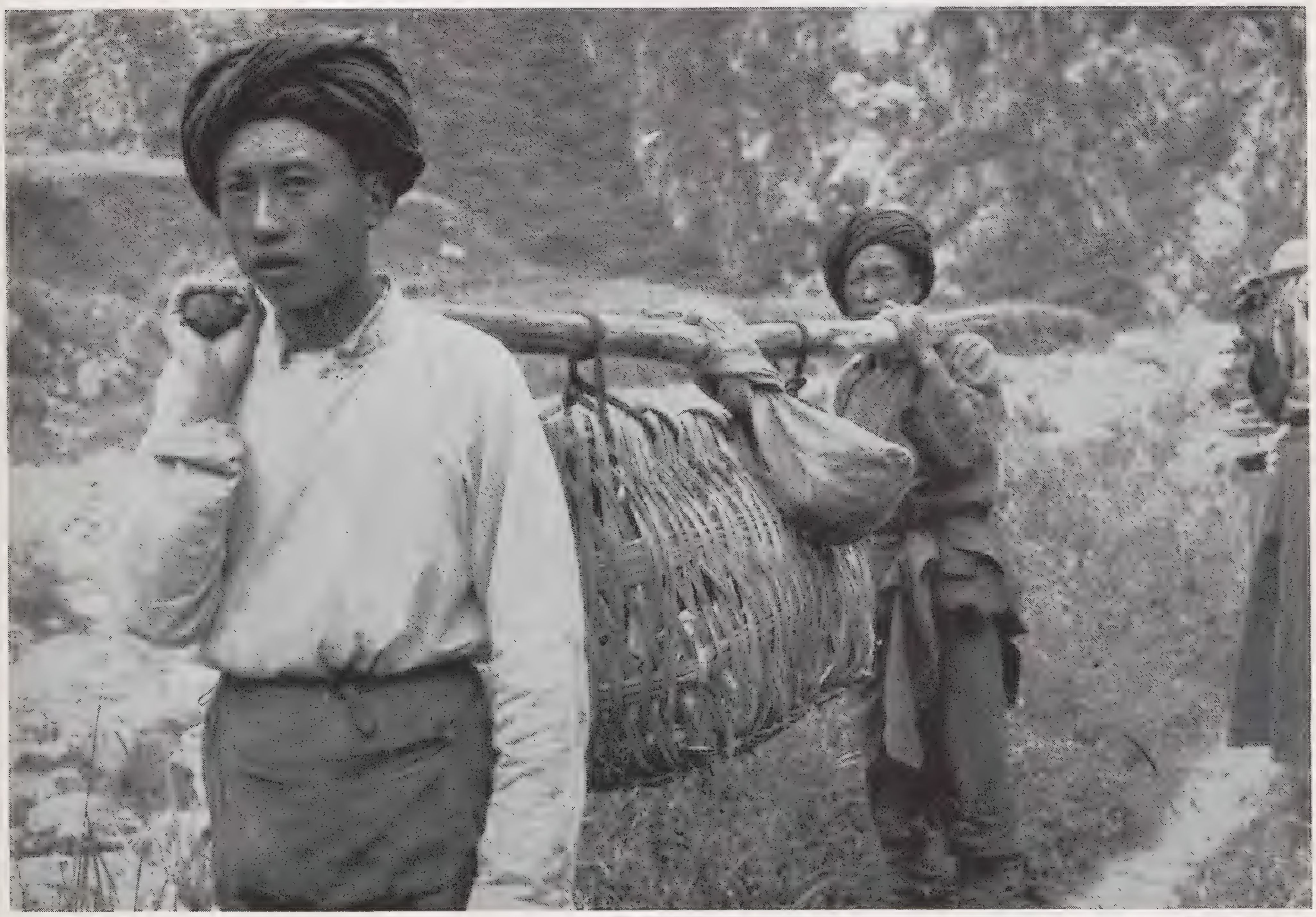
However, from Mr. K'ang, the county magistrate, we obtained a letter asking Mr. Yang to sell the panda to us because it was wanted by the Chinese Government. With this letter Den Wei-han started after the panda. There were many difficulties to overcome but on the evening of the fifth day he returned with the baby — a fine female, about six months old at that time, weighing 42 pounds and very lively but so friendly that a child could fondle it.

During the absence of Den Wei-han I became very ill, possibly with influenza. However, the morning after Den Wei-han's return with the panda we started back toward Wen Ch'uan where we arrived late in the afternoon of September 28. That night we had to complete financial arrangements for the purchase of the panda and to plan the trip to Chengtu. It was twelve o'clock when we got to bed and I was very tired and weak. Next morning we got up at five o'clock, fed the panda, had breakfast, and with the precious animal started for Chengtu. By fast travel I reached Kwanshien at four o'clock on the afternoon of September 30 and there Dr. Frank Price met me and carried us the same evening by car to Chengtu.

A few days after I left Ts'ao P'o the hunters captured another live panda. While the animal was being pursued by men and dogs, one of the hunters ran up, seized it, and overpowered it with his bare hands. His clothing was torn but otherwise he escaped without injury. This panda, which was a male at that time probably ten or eleven months old and weighing about 60 pounds, arrived in Chengtu on October 13.

For a month the pandas were cared for at my home on the campus of West China Union University, in Chengtu. Every day they had many visitors. Governor Tsang of Szechwan Province came three times, and on his second visit he brought the governors of Fukien and Shansi Provinces.

Then, on October 24, John Tee-Van arrived to take the pandas to their new home.



One of the babies was carried out of the mountains in a bamboo basket slung on poles. Where the road was comparatively level, the going was easy enough. Even so, in such rough and mountainous country, a journey of only a few miles might well take two or three days and distances were computed by the number of days of travel involved.

Flame-in-the-Forest

From the Andes of Colombia Came the First Living Specimens of the Scarlet Cock-of-the-Rock Ever Exhibited

WILLIAM BRIDGES

BEDLAM, in its heyday, probably resembled the receiving room of the Bird House during the first two hours after Charles Cordier arrived from Colombia on December 9 with 12 Scarlet Cocks-of-the-Rock, 22 hummingbirds and 47 other birds of the utmost brilliance and rarity — the greatest single collection of birds to reach the Zoological Park since Curator of Birds Crandall himself came in from New Guinea with his birds of paradise in 1929.

Down the center of the long, narrow room the wicker cages of the newcomers were stacked three-deep. The birds were hungry, and they were excited. They fluttered and called in a tropical symphony of chirps, squeaks, squawks, whistles and twitters. Three keepers moved rhythmically down the line unhooking feeding bottles and trays, scrubbing them in warm water, and filling them up again with fresh warm food. Cordier himself, a deliberate and methodical giant, followed after to wave tempting morsels under the beaks of the shyer feeders.

The line of cages ranged from the stout boxes of the Cocks-of-the-Rock at one end to the fragile hampers of hummingbirds at the other, and around the hummers Curator Crandall, Captain Delacour and everyone else who could be pressed into service, worked hard and fast to revive the chilled and hungry Wood Nymphs, Heavenly Sylphs and White-footed Racket-tails that needed help.

To a layman's eye it was a hopeless job. At least half the feathery mites seemed doomed. They managed to cling weakly to their perches or frankly gave up and lay in fluffy despair on the floors of their cages. Without strength to hover in front of their feeding bottles, they closed their tiny eyes and waited for the certain end.

The end, in every case, was warmth and plenty of sweetened, liquid food, with a complete revival to active life. The more desperate cases were picked out and warmed in the shelter of cupped hands held over a hot radiator. Warm breath expelled over them helped to revive others. And by the time the chill had disappeared from their minute bodies, warm food was waiting and they had regained strength to hover and feed.

By mid-afternoon the emergency was over and some kind of calm was restored to the Bird House and its staff, but the deeper excitement that springs from the sight of such magnificent birds, and particularly the Scarlet Cock-of-the-Rock which had never before been seen alive outside of the jungles of Colombia and Ecuador, will probably never quite die out.

For the flaming color of the Scarlet Cock-of-the-Rock is not quite of this world. The thin, rounded crest that almost hides the orange bill, and the head, shoulders and breast, are a glowing and yet translucent scarlet; in sunlight the feathers remind one of scarlet wax. And as a foil to the scarlet body, the bird's wings are glistening black and a shawl of monastic gray lies across the back.

Magnificently beautiful as the birds are against the gray-blue and green backgrounds created for them in the Bird House, they evoke a more dazzling picture still when one thinks of them flashing through the Colombian jungle, in and out of the shafts of sunlight. They show a preference for nesting in rocky ravines, often in niches behind a mountain waterfall — another picture that invests them with romance. "First time on exhibition" birds are always exciting, but never so much as when they are authentic beauties.

It is the kind of excitement that brought Sam Stacey, the veteran and honorary headkeeper of birds, posthaste into the Zoo from his home in Westchester. Sam had been enduring a spell of illness and did not really feel fit to go out, but he had read about the arrival of the Scarlet Cocks-of-the-Rock and he couldn't stay away. All smiles, he paced back and forth in front of the row of cages and examined each bird with a professional's eye.

"That one's droopy – needs a bit o' handling. That one's fit – he's a beauty." And then he paid Cordier a great and sincere compliment. "But I don't need to tell *you,* and you don't need to h'ask *me.* You *know* how to take care of birds!"

Charles Cordier does, indeed, know how to take care of birds and it is only because he is one of the four or five best bird collectors in the world today that the Colombian collection reached the Zoological Park in such numbers and in such fine condition. And yet the circumstance that resulted in the acquisition of the collection was more or less accidental. Like so many other things nowadays, it was partly due to the war.

Cordier is a Swiss citizen who grew up with a love of birds and a desire to see them in their native haunts. His family planned for him a life in business, but a dozen years ago he resolved that birds were going to be his career.

He made his way to South America and, uncertain how to begin, undertook to make collections for an established dealer in birds and to care for them on the voyage to Europe. At that time Captain Jean Delacour was employing the dealer to collect tropical American birds for his

Charles Cordier and one of his prizes—a Scarlet Cock-of-the-Rock. Cordier is considered one of the four or five best bird collectors in the world today, not only because he knows how to catch elusive specimens, but more importantly because he has the skill and patience to keep them alive and to settle them on an artificial diet.

aviaries at Clères, and thus Delacour and Cordier became acquainted. After a few trips to France, Cordier offered to make collections as Captain Delacour's own representative, and consequently he was kept busy for the next few years – in Indo-China, Brazil, French and Dutch Guiana and in Guatemala. He very quickly proved that he knew how to get rare birds from the most difficult parts of the world and, more importantly, how to "meat them off" on artificial food and to transport them in good condition.

Then the war came, the invasion of France and the destruction of the aviaries at Clères. Captain Delacour lost touch with his collector; he knew only that he was somewhere in South America.

Cordier's work was known to Curator Crandall and to a few owners of private aviaries in this country and Cordier, unable to write to Captain Delacour in France, corresponded with acquaintances in the United States, offering to make collections for them in South America.

Before any arrangement was worked out, Captain Delacour arrived in the United States and became technical adviser to the Zoological Park – and here he learned that Charles Cordier was in Venezuela, unable to return to Europe because of the war and anxious to start collecting birds again.

As it happens, there have been few attempts to collect, alive, the birds of the Colombian Andes, although museum expeditions have surveyed the area extensively and have charted the ranges of many species. Obviously the great prize from that region was the Scarlet Cock-of-the-Rock – and here seemed a wonderful chance to get the first living specimens. Cordier was commissioned to go in, get what he could, and bring his collection to New York.

In Caracas, Venezuela, Cordier bought himself an old touring car and started for the Cock-of-the-Rock territory in the southwestern corner of Colombia. A glance at the map will reveal that he had to thread his way across and down the Andes – and the roads were just what one would expect them to be in such wild country. Cordier explained that they were "fair" in some places, meaning that the car could average 15 miles an hour. Other places they weren't even "fair," and Cordier wonders now how the car managed to stand up as long as it did. It disintegrated at Cali, and from there he had to travel by bus. The bus traveled when, and as fast, as it could.

His route was, roughly, from Caracas to Cúcuta, Bogotá, Ibagué, up the Cauca River valley to Cali, up to Popayan and Pasto, thence in the direction of Tumaco on the coast of Colombia. He halted finally at Ricaurte, about 90 miles inland from Tumaco.

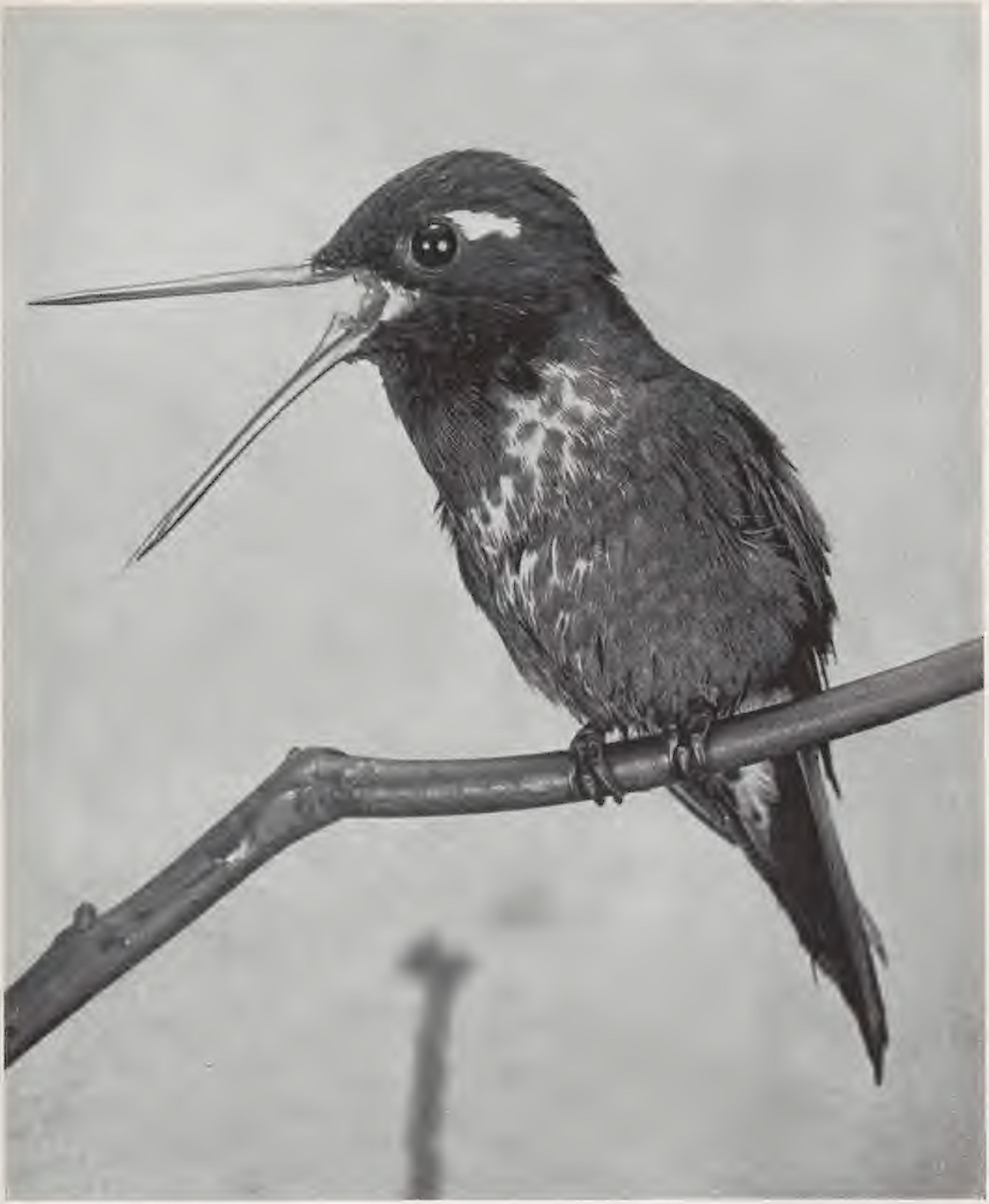
By standards in that corner of Colombia, Ricaurte is an important town of some forty or fifty houses elevated on stilts because of the almost constant rain. Here in the subtropical belt the humidity is at the saturation point most of the time; deluges fall many times a day except during the short dry season. Naturally, the vegetation is luxurious, and so heavily draped in moss that some of the trees are almost formless. And at the very outskirts of the village the sides of the Andes rise steeply.

The arrival of the collector was a matter of general interest in Ricaurte and Cordier immediately let it be known that he wanted the Scarlet Cock-of-the-Rock, hummingbirds, and almost any other brilliant bird of the neighborhood. He was in extraordinary luck, for he was taken within a few minutes to one of the stilt-perched houses – and there, on the verandah, were loosely tied two young Cocks-of-the-Rock!

It appears that on rare occasions a "tourist" – usually a city-dwelling Colombian – passes through Ricaurte along the Tumaco road, and the natives had noticed that these occasional visitors would pay good cash money for brightly-colored birds. Cordier bought them, an immature pair in rich chocolaty-brown plumage, for half a peso apiece. Twenty-eight cents each.

During the weeks that Cordier made his headquarters at Ricaurte he collected far and wide. Hummingbirds could be captured all around the village as they fed on low-growing flowers. A tiny limestick on the tip of a 30-foot bamboo pole was all the equipment needed; one touch of the sticky lime to their wings as they fed, and they were stuck fast, unhurt but unable to move until the gum had been washed off.

The Scarlet Cocks-of-the-Rock were not so easy. Inhabitants of the gloomy, moss-hung forests high above the village, the collector had to



Courtesy PM—David Eisendrath, Jr.

In this picture, about twice its natural size, the tiny little White-tip seems to be a dangerous bird with a needle-pointed bill. In actuality it is one of the most fragile and delicate of the Hummingbirds brought back from Colombia by Charles Cordier—a mere mite of blue and green iridescence.

climb the sides of the Andes for two or three hours each time he set or visited his nets. And climbing it was; the natives who acted as his guides and helpers apparently had no knowledge of the principle of the zig-zag path, for they never went around — they always went straight up.

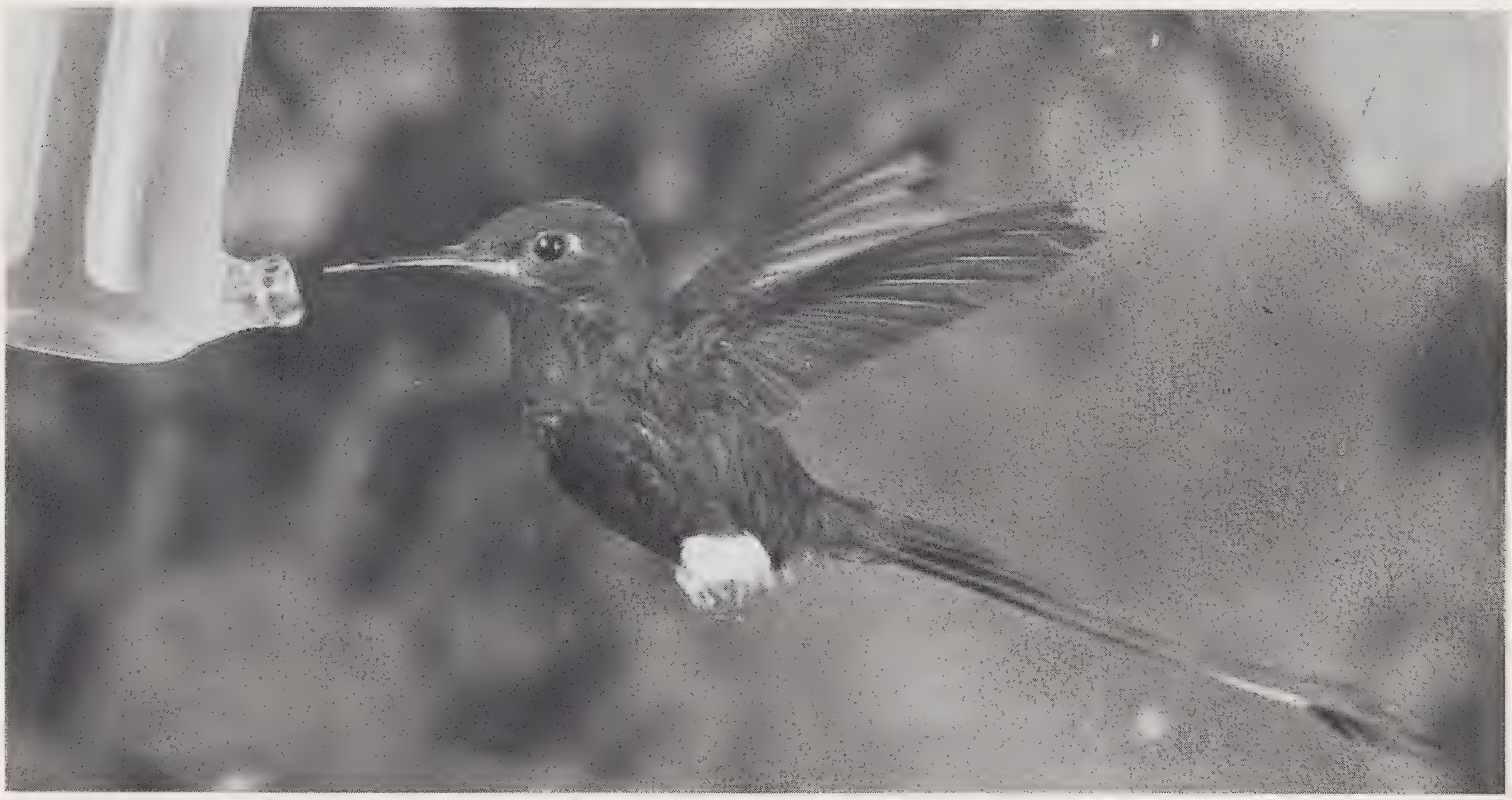
"I followed them, but it was not easy to climb for three hours when you have had only a cup of black coffee at five-thirty in the morning. And it was not very good coffee, either," Cordier said.

His companion on those early morning trips ordinarily scorned the ripe bananas that could be picked near the village; bananas he considered good to eat only when picked green, boiled and moulded into patties. But after a 5:30 A.M. start, he usually ate any kind of bananas he could find.

Cordier's method of netting the birds was to "scout" an area in which one or more Cocks-of-the-Rock customarily fed, to observe the habitual line of flight of a particular bird, and then to stretch his thin, silk-strand net across the path of flight. The net was so designed that no matter from which side a bird flew into it, it found itself in a loose pocket.

The labor of setting up the nets was so great that they were customarily left in one spot for several days, as long as there was any chance of catching more birds. Overnight the careful arrangement of the strands invariably was disarranged by bats and gigantic beetles that blundered into the net. The first duty each morning was to extricate the bats and beetles and then loop together the inner and outer sections of the nets.

Other birds besides the Cock-of-the-Rock flew into the nets, of course, and thus as a sort of dividend on his efforts Cordier caught most of the fine series of callistes, tanagers and sugar-birds he brought back.



Courtesy PM—David Eisendrath, Jr.

One of the White-footed Racket-tails hovers in front of its drinking bottle. Note how the minute feet are drawn up into the white "pantalettes." This picture, like the one on the preceding page, was taken with a stroboscopic light that gives a brilliant illumination lasting for about 1/30,000th of a second, thereby stopping motion.

The collector used, at various times, sixteen nets, the larger ones being 50, 150 and 330 square feet in surface. One Cock-of-the-Rock was caught only 8 feet above ground, others at 15 to 50 feet, and two at about 100 feet.

On one occasion he set the net and was standing quietly under a tree watching a Cock-of-the-Rock which had just about finished feeding and was ready to fly to its favorite perch on the other side of the net. Cordier heard a stealthy sound behind him and then a loud "Bang!" and the Cock-of-the-Rock fell dead. An Indian and his wife, on their way to visit a neighbor some miles away, had spied the tasty morsel of food and collected it in their own way.

Cordier spoke his mind to the Indian, although he admitted afterward that from his own point of view the poor fellow had every right in the world to shoot a bird which, to him, represented merely an item of food.

The firing of the gun ended collecting in that neighborhood for the day, but the following day Cordier returned and spent the morning swearing ineffectually at a Scarlet Cock-of-the-Rock that was flying all over the neighborhood — everywhere except through the path blocked by the net. He was almost in a state of mind to wish the Indian would come back and shoot the bird — when the Indian did come back.

But he had learned his lesson; he was not shooting any more birds in *that* neighborhood. He and his wife blundered along the trail and the noise of their passage startled the Cock-of-the-Rock. It flashed down through the trees, straight into Cordier's net!

The collector completed his work late in October and with his birds safely housed in small cages that he had carried with him, he worked his way slowly up through central Colombia and then across to the coast, sailing from Buenaventura near the end of November. On December 9, 1941, he disembarked in New York with the greater part of his original collection intact — the finest single collection of live birds ever made from that part of the world.

* * *

Efforts are now being made to get visas and permits to enable Cordier to return to Central America to seek other rarities. If all goes well, he will reach his new collecting fields early in March; if war conditions make it impossible for him to arrive before the end of the month his collections will have to be postponed until after the breeding season. In any event, it seems probable that the Society will in the coming year receive other important collections of birds from out-of-the-way corners of South America.

BIRDS RECEIVED FROM CORDIER EXPEDITION, DECEMBER 9, 1941

*** indicates first exhibition alive anywhere. (Several others probably have never been exhibited alive, but records are uncertain.)

Only three of these birds had been exhibited in the New York Zoological Park previously — the Orange-rumped Tanager, Yellow-rumped Tanager and Crimson-backed Silver-beaked Tanager.

Specimens	*Common Name*	*Scientific Name*	*Distribution*
1	Green-headed Wood Nymph.	*Thalurania fannyi verticeps.*	W. Colombia and Ecuador
*** 2	Wilson's Incas.	*Helianthea wilsoni.*	S. W. Colombia and N. Ecuador
*** 5	Heavenly Sylphs.	*Cyanolesbia coelestis coelestis.*	W. Colombia and W. Ecuador
5	Black-billed Emerald Hummingbirds.	*Chlorostilbon melanorhynchus.*	Ecuador and S. W. Colombia
*** 5	White-footed Racket-tails.	*Ocreatus underwoodi underwoodi.*	Colombia
1	Green-headed Emerald Hummingbird.	*Agyrtrina viridiceps.*	W. Ecuador and S. W. Colombia
*** 2	White-tips.	*Urosticte benjamini benjamini.*	Ecuador and S. W. Colombia
*** 1	Empress Eugenie's Hummingbird.	*Eugenia imperatrix.*	Ecuador
*** 1	Club-winged Manakin.	*Allocotopterus deliciosus.*	W. Ecuador and S. W. Colombia
4	Colombian Green Sugar-birds.	*Chlorophanes spiza subtropicalis.*	Colombia
2	Blue-winged Mountain Tanagers.	*Compsocoma flavinucha cyanoptera.*	W. Colombia and W. Ecuador
2	Orange-rumped Tanagers.	*Ramphocelus flammigerus.*	Colombia
7	Yellow-rumped Tanagers.	*Ramphocelus icteronotus.*	Panama to W. Ecuador
2	Crimson-backed Silver-beaked Tanagers.	*Ramphocelus dimidiatus dimidiatus.*	Panama to Venezuela
*** 1	Green-backed Mountain Tanager.	*Compsocoma flavinucha victorini.*	E. Colombia
1	Colombian Red Tanager.	*Piranga flava desidiosa.*	W. Colombia
1	Southern Emerald Calliste.	*Calospiza florida auriceps.*	E. Panama to W. Colombia
2	Rufous-throated Callistes.	*Calospiza rufigula.*	W. Colombia and W. Ecuador
15	Western Golden Callistes.	*Calospiza arthus occidentalis.*	W. Colombia
1	Buff-naped Calliste.	*Calospiza ruficervix ruficervix.*	Colombia and West Ecuador
1	Rufous-headed Calliste.	*Calospiza ruficapilla.*	Colombia and N. W. Ecuador
3	Ecuadorian Red-headed Callistes.	*Calospiza gyrola nupera.*	Ecuador and S. W. Colombia
4	Western Colombian Barbets.	*Eubucco bourcieri occidentalis.*	W. Colombia
***12	Scarlet Cocks-of-the-Rock.	*Rupicola peruviana sanguinolenta.*	W. Colombia and W. Ecuador

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

SAFE IN VENEZUELA

Word was received during February that Dr. William Beebe and his staff had arrived safely at Caripito, Venezuela, where they will resume studies of a tropical jungle. Since they travelled by steamer through an area where submarines have recently been active, Dr. Beebe's cable announcing his arrival was received with a feeling of relief.

Cut off by the war from all marine research around Bermuda and in the Pacific ocean where it has been working for several years, the Department of Tropical Research of the Zoological Socity seized the opportunity offered in Venezuela to take up basic studies in the jungle again. Dr. Beebe expects to be in Venezuela for six months and he will make a special effort to study the more primitive animals of the region, including several of the so-called zoological "missing links."

Among the forms of life he expects to investigate particularly are peripatus, the armored catfish, hoatzins, screamers, seriemas, tinamous, opossums, manatees, anteaters and sloths.

The staff on this expedition — the forty-second made by the department — includes Miss Jocelyn Crane, research zoologist, who will work primarily on a comparison of fidler crab courtships of the Atlantic swamps with those of related Pacific forms; Henry Fleming, entomologist; George Swanson, staff artist; and Miss Mary VanderPyl, field associate. The staff will also make collections of live mammals, birds, reptiles and insects for the Zoological Park.

The expedition is being conducted under the auspices of the Zoological Society and was made possible by a personal grant from the Simon Guggenheim Foundation of the Committee for Inter-American Artistic and Intellectual Relations. Help was also furnished by the Coordinator of Cultural Relations Between the American Republics and the Standard Oil Companies of New Jersey and Venezuela.

Although the general goal of the expedition is an investigation of more primitive forms of life in Venezuela, Dr. Beebe hopes to gather notes that will fit into studies he laid aside nearly twenty years ago when he discontinued the Society's field station at Kartabo, British Guiana.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Fellow
Dr. Myron Gordon

Annual
Mrs. Richard C. Colt
Peter Grimm
Sydney P. Monroe
Bayard W. Read
James H. Ripley
Miss Thursnelda Swenson

Junior Member
Melvin C. Kurtz
Adele Olyphant
Edith Mathews Read
Jean Walker

Life
Mrs. Ethel B. McCoy

THE AQUARIUM EXHIBITS

Certain of the New York Aquarium exhibits that were retained when the old institution at Battery Park closed its doors last October to make way for the Brooklyn-Battery Tunnel have been installed in an experimental setting in the Lion House in the Zoological Park and were opened on February 12. The new installation and public reactions to it will be discussed in an article in the March-April issue of *Animal Kingdom.*

A NEW PAY DAY AT THE ZOO

Membership cards and guest tickets issued to members of the Zoological Society automatically became one-third more valuable on Tuesday, February 10, when a third day in the week was made a pay day at the Zoological Park. Admission of 10 cents for adults and 5 cents for children between the ages of 5 and 12 years is now charged on Tuesdays, Wednesdays and Thursdays. All holidays, on whatever days they fall, are free and members of the Society are, of course, admitted free at all times on presentation of their cards or guest tickets.

Until last spring the admission charge was 25 cents and 15 cents, but it was found that the reduction to 10 cents and 5 cents, because of a much greater attendance, actually produced an increase in total gate receipts.

ADMINISTRATIVE CHANGES

A new administrative plan for the Zoological Park and Aquarium was formulated by the Executive Committee at its meeting on January 22.

Allyn R. Jennings, who was general director of the Zoological Park and Aquarium since July, 1940, has left this position to become associated with Pan American Airways in an engineering capacity. Captain Jean Delacour has become technical adviser to the staff, John Tee-Van has assumed the title of executive secretary, and Harry Sweeny, Jr., assistant general director since July, 1940, has become superintendent of construction and operation.

WE TEACH ZOOLOGY

Beginning in February, the Zoological Park is offering a series of Saturday morning lectures in vertebrate zoology which will continue until May 16. The course is primarily for teachers in the New York City schools, who are granted two "alertness credits" for attending. Despite the draft and the increasing number of defense activities in which teachers are engaged, the enrolment in the course has been high.

About thirty teachers have enrolled for the course and an equal number of Junior Members of the Society have attended the lectures by members of the Zoological Park's staff. Lectures are given at 10:30 A.M. each Saturday in the Rockingstone Lecture Hall in the Zoo and the speakers include Drs. Goss, Nigrelli, Ditmars and Leister, and Messrs. Tee-Van, Crandall and Mathewson.

AIR RAID PRECAUTIONS

Ample precautions are being taken in the Zoological Park to protect the public and the animal collection in the event of an air raid over New York.

Guided by the experience of the London Zoological Garden on which more than 50 bombs have fallen without a single animal being killed or any dangerous animal escaping, an Air Raid Precautions force was set up here to deal with possible emergencies. Keepers and maintenance men, who rotate tours of duty, have been assigned to sleep in the Park each night and special fire-fighting apparatus has been acquired and the men trained in its use.

No animals will be destroyed for the present because it is believed that other precautions are more than ample. The large cat animals in the Lion House are locked each night in their steel and concrete inner sleeping compartments and all elephants in our herd are securely chained at night. Poisonous snakes present no hazard at this season because they would be immobilized by the cold within a few minutes outside their steam-heated shelters. The cages of poisonous snakes are labeled on their rear doors to guide the Air Raid Precautions Squad.

"WHAT'S NEW AT THE ZOO?"

Again under the sponsorship of the Columbia Broadcasting System, the Zoological Society's series of radio programs, "What's New at the Zoo?" was resumed in January. The programs are presented each Sunday afternoon at 1:35 o'clock over station WABC locally and over the Columbia network from coast to coast. John Reed King, who was announcer for last summer's programs, is again in charge of the series.

* * *

On July 12, 1922, we purchased from the late Ellis Joseph a pair of Regent Birds (*Sericulus chrysocephalus*). The male of this rare Australian relative of the Bower Birds is one of the most beautiful in the world – the lovely combination of velvet black and rich orange finds perfection in this species. For some reason, so subtle that so far it has not been fathomed, these handsome males are difficult subjects in captivity. In this case, the male lived until June 21, 1930, the period of nearly eight years being unusually good. The somberly-colored female, however, remained in robust health and continued in apparent good condition until a day or two before her death on October 16, 1941. This period of 19 years, three months and four days probably establishes a new longevity record for the species in captivity. – *L. S. C.*

* * *

The largest number of wild ducks in several years have been spending the winter on the Wild Fowl Pond in the Zoological Park. At the end of February there were approximately a thousand birds on the pond – mostly black ducks, mallards, baldpates and pintails. One ring-neck duck, the first that is known to have wintered here, joined the flock in January.

PUBLICATIONS

ELEPHANT TALES. By Esse Forrester O'Brien. The Steck Company, Austin, Texas. $2.00.

Here is a sure-fire book for the younger generation, founded on the unbeatable combination of elephant and circus. There are twenty-eight tales about elephants, each one designed to bring out some characteristic of these huge but lovable animals. Tales of pygmies and giants; babies and centenarians; gentle, harmless souls and murderous rogues. All pass on parade before us.

Elephants are expensive to maintain in captivity and many of our smaller zoos cannot afford to keep one. Most of the elephants brought to this country have therefore gone to the circus. "Elephant Tales" gives a good account of a number of these animals, some of them famous throughout our own and other lands. Famous zoo elephants likewise come in for a fair share of the discussion.

The tales of "How Wild Elephants Live," "Elephants Are Usually Good," and "When Elephants Cause Trouble," give us an excellent picture of elephant habits, foibles and capabilities. "Temperamental Elephants" tells how the best-trained and erstwhile dependable elephant may, upon occasion, have a tantrum and demonstrate most convincingly that she has a mind of her own.

Our Bronx Zoo elephants, Kartoum, Alice and Congo, are found within the pages of this book. The mighty Kartoum and pygmy Congo, along with other characters mentioned, live no more, but they all have helped to spell an intriguing, magic word — elephant.

"Elephant Tales" is well illustrated with an excellent selection of photographs showing elephants at work and at play. — *Claude W. Leister.*

PAGEANT IN THE SKY. By Raymond S. Deck. Dodd, Meade & Co., New York, 1941. $3.00.

Many people like birds and many have much knowledge of the subject but the ability to pass on their reactions in pleasant form is vouchsafed to very few. Mr. Deck has had much experience with birds, both at home and at varied points on this great continent and he writes of them in an intimate, personal manner that is very charming. He does it, too, with what seems to me a most successful distinction between sincere interest and mere sentimentality, a line by no means always easy to draw.

This is not a bird book, in the technical sense, but has to do mostly with what birds do and how they live. It covers migration, nesting, winter feeding, protection and a host of similar phases, illustrated throughout with anecdotes and experiences.

The opening chapter has to do with what we have formed the possibly reprehensible habit of calling the "mystery" of migration. Interesting though Mr. Deck's facts and stories are, he closes with the mystery unsolved, which no doubt we should not mind, as no one has solved it yet. But later, in a casual discussion of sex functions, he says:

> "Internal secretions induce in appropriate weather such seasonal phenomena as song, fighting and mating. They may even provide the signals for migrations."

In these sentences, it now appears, we may yet find the solution of our mystery.

So much has been written about the dreadful slaughter of game perpetrated in this country by our forebears, that it would seem no new word could be said. Yet in "Dead End" Mr. Deck gives an account of the butchery of the now extinct Passenger Pigeon, that reaches new horizons of horror. The last Passenger Pigeon died a peaceful death in the sanctuary of the Cincinnati Zoological Gardens on September 1, 1914, long after its last wild relative had perished. Its passing marked the close of a most unpleasant human commentary.

There is an amusing chapter on "What is a bird good for?" Amusing to the hardened naturalist, at any rate, for this is a challenge to which we respond very badly, invariably floundering in a sea of words which always fall short of their purpose. For what birds are good for is a something for which direct words have not been found. In a prelude called "Salute to a Brown Bird," Mr. Deck says things about the Veery that come much closer to an answer to the question.

Numerous excellent photographs by the author complete a book which, from title to index, will delight every nature lover. — *Lee S. Crandall.*

BOOK BARGAINS

Publications of the New York Zoological Society
Offered at Savings of 50¢ to $1.50

THE AMERICAN BISON

By Martin S. Garretson

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for the first accounts of its appearance and habits, pictures its wide range and incredible numbers. It sets forth authentically the natural history of the animal, describes the tragic course of extermination that ranged unchecked until there were only 1,091 bison left in the whole of North America, and then it tells of the rise and development of a strong national sentiment that saved the species from extinction. *254 pages, 65 illustrations.*

Was $2.50 . . . . . Now $1.50

PETS AND HOW TO CARE FOR THEM

By Lee S. Crandall

As Curator of Birds in the New York Zoological Park, Mr. Crandall has responsibility for the diet, health, cage conditions and general well-being of some 2,000 birds of many species. Out of his experience with the Zoological Park's collection and a life-long enthusiasm for pets of every kind, he has written a completely authoritative and practical book on pets and their maintenance in good health. He devotes individual chapters to Dogs, Cats, Domestic Rabbits, Small Wild Animals, the General Care of Birds; Pheasants, Peafowl and Guineafowl and Quail, Waterfowl, Parrots, Cage Birds, Canaries, Domestic Pigeons, the General Care of Fishes and Aquarium Fishes. *296 pages, 96 illustrations.*

Was $2.00 . . . . . Now $1.00

PRESENT DAY MAMMALS

By Claude W. Leister

Students in Zoology and Biology classes and the general reader who has often been puzzled by the relationship of animal groups will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. It answers such questions about mammals as: What does it look like? How big is it? To what is it related, and why? Whence does it come? Typical representatives of every Order of mammals are pictured here, accompanied by a clear text explaining the zoological status of the animals. *74 pages, 106 illustrations.*

Was $1.00 . . . . . Now 50 cents

Order from:
Department B, Zoological Park, Bronx Park, New York City
(Make checks payable to New York Zoological Society)

NEW YORK ZOOLOGICAL SOCIETY

XLV • No. 2

MARCH–APRIL 1942

673
59

ANIMAL KINGDOM

INSTITUTION
1942
E
NATIONAL MUSEUM

BULLETIN, PUBLISHED BY THE
NEW YORK ZOOLOGICAL SOCIETY

BONS IN THE WILD AND IN THE ZOO, *by Jean Delacour* • MOUND-BUILDIN
TS, *by Theodore Kazimiroff* • THE FROGS OF PARADOX POND, *by Dr. Ditmar*

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

ASST. TREASURER
City Bank Farmers Trust Company

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
George C. Clark
C. Suydam Cutting
Alfred Ely
Marshall Field
De Forest Grant
David H. McAlpin
Robert Moses
Fairfield Osborn

BOARD OF TRUSTEES

Class of 1943

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York

The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

William Bridges	*Editor & Curator, Publications*
Jean Delacour	*Technical Adviser*
C. J. McGahey	*Comptroller*
Harry Sweeny, Jr.	*Supt., Construction & Operation*
John Tee-Van	*Executive Secretary*

ZOOLOGICAL PARK

W. Reid Blair	*Director Emeritus*
William Beebe	*Honorary Curator, Birds*
Lee S. Crandall	*Curator, Birds*
Raymond L. Ditmars	*Hon. Curator, Reptiles & Insects*
Leonard J. Goss	*Veterinarian*
Claude W. Leister	*Curator, Mammals*
Harry C. Raven	*Associate in Anatomy*

AQUARIUM STAFF AT ZOOLOGICAL PARK

Charles H. Townsend	*Director Emeritus*
Charles M. Breder, Jr.	*Director*
Christopher W. Coates	*Aquarist*
Ross F. Nigrelli	*Pathologist*
George M. Smith	*Research Associate in Pathology*
Homer W. Smith	*Research Associate in Physiology*
Myron Gordon	*Research Associate in Genetics*

DEPARTMENT OF TROPICAL RESEARCH
William Beebe, *Director*

Jocelyn Crane	*Research Zoologist*
Henry Fleming	*Entomologist*
George Swanson	*Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLV APRIL 1, 1942 NO. 2

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York, N. Y. Title registered in the United States Patent Office.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

Spring comes. In the midst of its radiance the human race forges metal and flame and death. In a carnival of misery man searches for relief. Nature offers it to him.

Several times in recent months I have wondered why it is that the men and women in our organization are so particularly intent, so ready to put "everything they've got" into the work of the Society. With the war hitting hard at all of us, mentally if not physically, one might expect a let-down. The opposite is happening. One reason is that we are all observing at first-hand, and with a fresh eye, so to speak, that the public is finding, in the pageantry of animal life, a kind of "relief" it wants and needs. The handiwork of nature looks good to everybody in this dark and troublous year. The strategies of the parasol ants are different but compare favorably with those of parachute troops. The pandas at play are a powerful antidote to thoughts of pogroms in Poland. Even the sharp, fierce clash of two tigers over their meat appears rational, refreshing even, against the mental backdrop of torpedoes, tanks and typhus. So we greet the Spring almost cheerfully and determined to do everything in our power to make this year score heavily in giving the public not only enjoyment, to be sure, but perhaps more than that – perhaps better understanding.

It is more than a maintenance job that we have ahead of us. We are engaged in new developments. Only through these, by trial – by some error – and by trial again, can we improve upon our methods of presentation. Living animals are of nature's essence and an understanding of them, and the story behind each one of them, carry their eternal lessons – in these days as in quieter times.

Fairfield Osborn

GIBBONS

Most systematists place the gibbon on the lowest branch of the evolutionary tree that represents the anthropoid, or man-like, apes. The orang-utan, the chimpanzee and the gorilla are supposed to outrank the little gibbon. However that may be, HYLOBATES *yields to no primate in interest, as Captain Delacour intimates in* GIBBONS – THE SMALLEST APES.

●

PICTURES

A vast number of interesting pictures are buried among the 20,000 negatives in the Society's photographic collection. In this issue and in subsequent ones we expect to pull a few of them out of the files and to display them prominently in the magazine. Interesting shots made by press and amateur photographers also will be used.

●

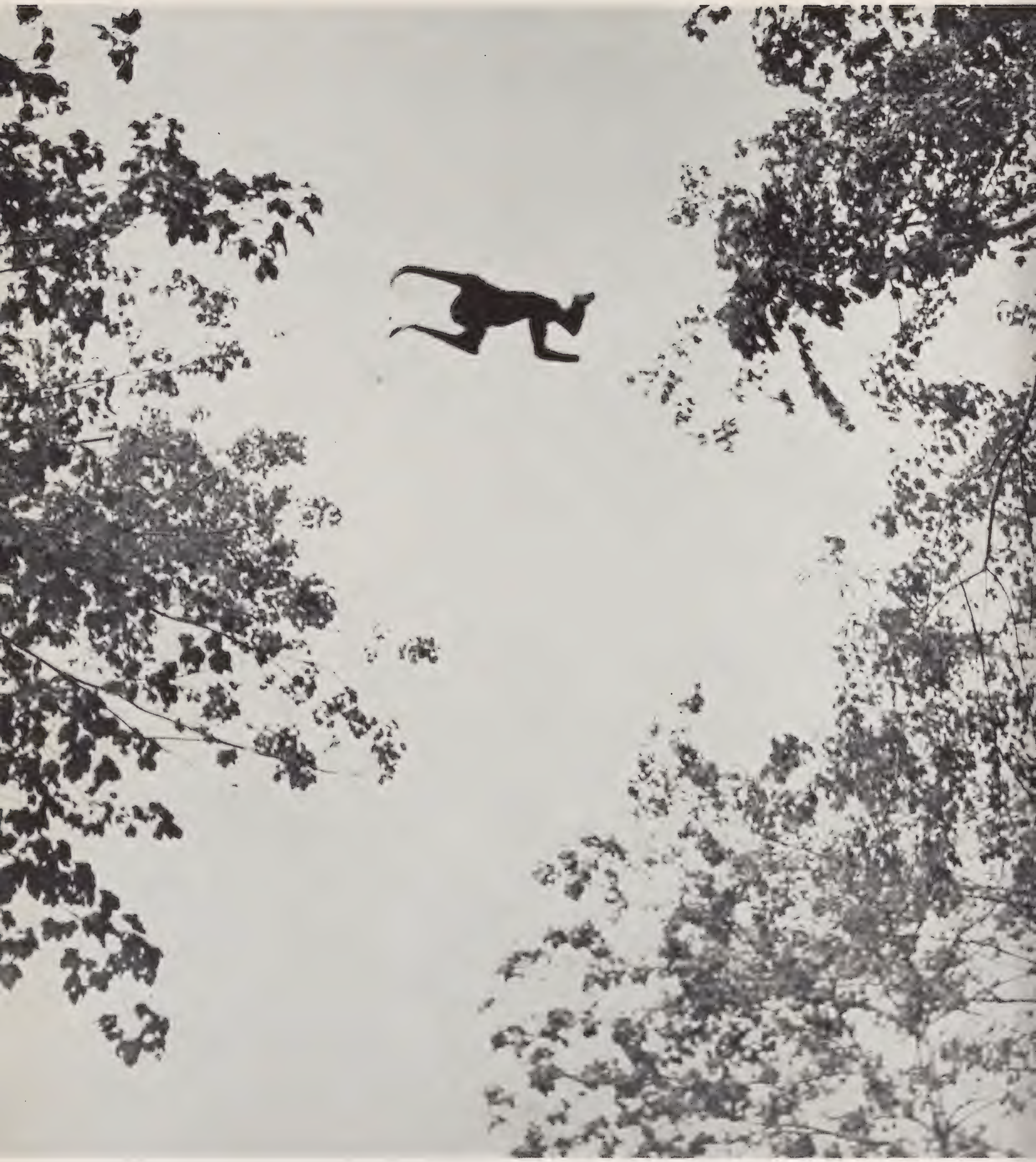
AUTHOR

Theodore Kazimiroff, the author of EMPIRE OF THE ANTS, *is on the staff of the New York University Dental College. His hobby is archaeology and natural history of the local area, and on a field trip he ran across the tremendous colony of Allegheny mound-builders featured in his article.*

IN THIS ISSUE

Gibbon on "Monkey Island" . . . . *William Fitz, Jr.* COVER
Gibbons – the Smallest Apes . . . . *Jean Delacour* 35
Empire of the Ants . . . . *Theodore Kazimiroff* 40
Pictures 43
Pisces in Leo . . . . *Christopher W. Coates* 47
The Frogs of Paradox Pond . . . . *Raymond L. Ditmars* 51
Behind the Scenes: News and Notes 56

APR 4 1942



Gibbons feel perfectly at home in trees—far more so than on the ground—and if any proof were needed, this picture would furnish it. Here one of the gibbons on our "Monkey Island" was photographed in mid-air as it made a flying leap from the tiny terminal branches of one tree to another. This leap was made about 50 feet above ground.

Gibbons—the Smallest Apes

Their Scientific Name Means "Dwellers in the Trees," and They Prove that It Is an Apt Designation

JEAN DELACOUR

It is possible that in the fairly near future southeastern Asia and the neighboring Malay islands will see many white visitors, but few of them are likely to have the time or the inclination to study one of the most fascinating mammals of that region — the gibbon. For some years to come, I suspect that research on this smallest of the anthropoid apes will be confined to museum skins and skeletons, and the habits and behavior of living specimens that zoological gardens are fortunate enough to have.

In the past fifteen years gibbons have been very much in fashion among zoologists. They really deserve the attention of specialists, and I think that I have my share of responsibility for this recent interest. The wonderful Indo-Chinese gibbons which have lived and bred since 1925 on my Normandy estate at Clères were at complete liberty or at least relative freedom. Undoubtedly they have done much to attract public interest as well as scientific attention to these marvelous apes.

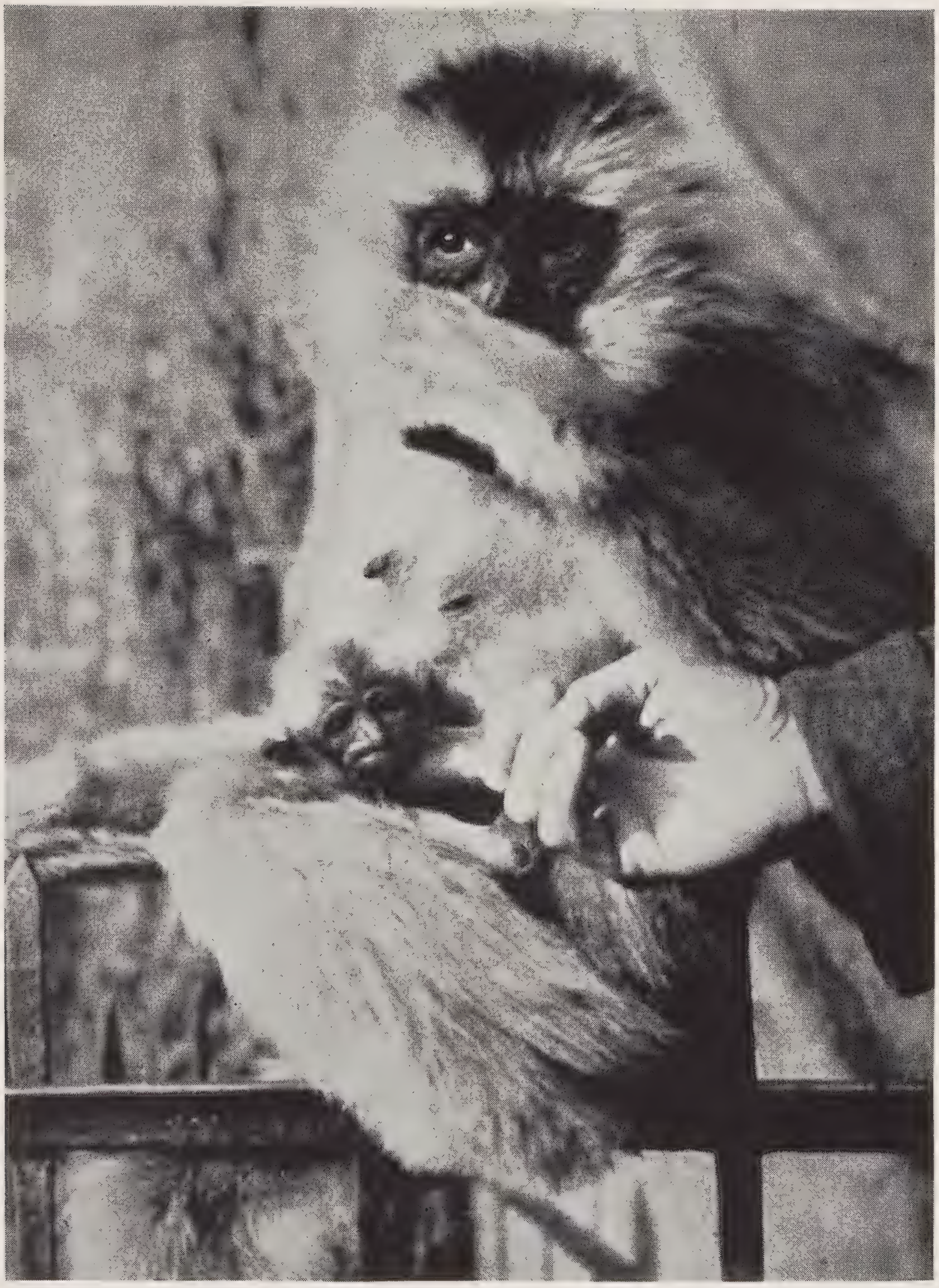
Knowing how interesting their arboreal life could be, I kept an eye open for a suitable exhibition place in the New York Zoological Park as soon as I joined the staff of the Zoo. An island near the southern shore of Lake Agassiz immediately recommended itself, having a fair number of good-sized trees and being not too far from the shore, so that visitors might easily watch the little animals. All that was immediately required was to clear away some of the underbrush on the island and provide access for the public on the neighboring shore. There were comparatively few gibbons in our collection and additional specimens were almost impossible to get, so they were supplemented by Central and South American spider monkeys which, like gibbons, do not harm the foliage and do not like to cross water. As a result, we had a most interesting display during the past summer and with the first fine spring days we expect to repeat it.

In the trees on "Monkey Island," as we somewhat inaccurately call the gibbon and spider monkey exhibition island, the gibbons took instantly and naturally to tree-dwelling life. At times, when they were calling in concert, I could stand on the shore and by shutting my eyes imagine that I was back at some half-forgotten camp in Indo-China where their antics and their ringing voices have charmed me innumerable times.

A great deal has been observed, said and written lately about gibbons, and as I have had perhaps more experience than any other investigator with these apes, I may be pardoned if I venture to give here a short resume of what I have learned about them in the field, in captivity and by study of museum specimens.

Of the four anthropoid or man-like apes — gorillas, chimpanzees, orang-utans and gibbons — the latter are the smallest and — to my mind — the most attractive. They differ noticeably from the other apes by the tremendous length of their arms and the lightness of their build. These are characteristics that of course equip them for a tree-dwelling life. Their long canine teeth and callous buttocks are other noticeable differences from the other three anthropoids.

Tree-dwellers as they are, gibbons are the only primates which on the ground walk on their hind limbs as men do. I doubt if they ever come to the ground, however, unless it is absolutely necessary.



An Indo-Chinese gibbon and her baby, born at Captain Delacour's estate at Clères. Poor as this photograph is—it was greatly enlarged from a tiny print—it shows a remarkable thing: the tameness of the animal. Adult gibbons are not always noteworthy for their tolerance of human beings, and especially when they are carrying new-born young. And yet this mother gibbon permitted a visitor to touch her baby.

Their upright walk is certainly far commoner in zoological gardens than in the jungle; it seems to be a habit induced by tameness and a change in normal surroundings.

Even the gibbon's scientific (generic) name, *Hylobates,* describes its habits accurately — a thing that scientific names seldom do. *Hylobates* means "Dweller in the Trees."

The long arms of the apes are their chief aids when they swing through the forest, for they make little dependence on their weak legs. They can throw themselves from branch to branch for a distance of thirty feet and, incredible gymnasts that they are, they practically never fall. They can cling to tiny twigs but generally they grip several at the same time and make certain of the strength of their support before relying on it.

As visitors to the Zoological Park will have observed in our Primate House where a series of parallel bars have been set up in the gibbons' compartments, they love to swing by one hand or one foot.

I have seen it stated that they cannot walk without holding their arms above their heads, and it is true that in following a large limb they walk upright with the arms held high to preserve a balance. In any event, on the ground they often progress with the arms curved around the sides of the body.

There are few more amusing sights in wild nature than young gibbons at play. They tease one another, they are marvelous jugglers, they carry on mock fights and pretend to bite. They roll and tumble. When playtime is over they like to lie on their backs in the branches of a tree, assuming all the positions of a lazy human being.

When it is time for the night sleep they sit erect on a very high and sometimes slender branch, gathering by twos and threes and huddling together. They often change their sleeping quarters and seemingly care very little where they settle down for the night.

Their hoo-hoo-hoo calling, a resounding cry that can be heard a long distance, can be heard early in the morning and from time to time through the day. The calls cease generally around 4 o'clock in the afternoon, however, for gibbons go to sleep early — a habit they keep in captivity.

Gibbons cannot swim, a very unusual condition among animals. As a rule they drink by dipping a hand into water and licking their fingers, which is the nearest approach to the method employed by primitive men.

In a wild state and where the habitat is suitable, the apes are widely distributed but nowhere are they found in great numbers. Small groups are the rule and the party generally consists of a mated pair and their offspring to the number of two to six, some of the offspring perhaps almost or entirely full-grown but still unmated. The members of each family live in a restricted area of perhaps 200 acres which they never leave and on which they tolerate no other gibbons. Intruders are warned off by voice — apparently a sufficiently well understood threat of what will happen if the intruder strays into preempted territory.

Captured adult gibbons usually refuse food and soon die of sorrow and starvation; they ought never to be caught. Young ones, on the contrary, quickly become tame and affectionate. They are rather delicate and need plenty of attention and careful feeding and fresh air. In the wild their food consists of fruits, berries, leaves and buds, with occasional insects and young birds and eggs, but captive specimens take milk, cooked rice, fruit and salad and on these they do very well.

Unfortunately, in the monkey houses of most

Largest of all the gibbons is the siamang, which comes from Sumatra and the Malay Peninsula. A fully-grown specimen stands about three feet high. Wallace, the naturalist, reported one siamang of this height that measured five feet six inches from hand to hand when its arms were outstretched at right angles to the body.

A typical scene on "Monkey Island" in the Zoo, with a gibbon dangling from one of the trees to inspect the interesting activities on the ground. If the gibbon were alarmed, it could draw itself up into the branches and climb to the top in a very few seconds.

zoological parks, gibbons are not easy to keep and show great susceptibility to disease. Oddly enough, in the open, even in rather cold climates, they do extremely well either at full liberty or in the merely comparative confinement of an island. At Clères, for example, gibbons have withstood without any appearance of discomfort temperatures as low as 5 degrees. I recall one young gibbon that survived such a temperature in 1940 although it had been born only the previous August. My gibbons at Clères had access to sleeping boxes in the trees but they almost never used them, preferring to seek the natural shelter of trees and branches. Some of my gibbons that had been imported in 1924 were still in perfect health in 1940 when we were forced to abandon Clères. Recently I have received information that some of my gibbons are still in good condition and that a baby was born on Christmas Day, 1941.

At the beginning of my experiments with gibbons I made a point of importing specimens from high altitudes only, thinking they would withstand cold European winters better. Gibbons live only in rain forests but they are found from sea level up to 8,000 feet and those from these higher altitudes would seem better adapted to the north of France. But I found later on that those from the steamy lowlands were just as hardy as the mountain specimens.

Now, as to the various kinds of gibbons. Classification is often made difficult by variation in the pelage in many forms, which is even now insufficiently known. There are differences of opinion as to the number of true species but I personally believe that one genus only and five principal specific groups can be admitted:

1. The Siamang, *Hylobates syndactylus*. These are represented by two slightly different forms in Sumatra and in the Malay Peninsula.
2. Intermediate gibbons between the Siamang and the Lar (*Hylobates klossi*) are found in the Mentawi Islands off the southern coast of Sumatra.
3. The Lar Gibbons, *Hylobates lar*. These are widely distributed in the Malay countries, including Java and Borneo, Tenasserim, Siam and Cambodia. There are numerous races which are not always well understood, but it would appear that they are all very closely related.
4. The Hoolock Gibbons, *Hylobates hoolock*. These come from Burma and Assam and in some respects much resemble the Lar.
5. The fifth group of gibbons live in Indo-China and Hainan, and are known as *Hylobates concolor*. They are extremely different from any of the others, having a much prettier face, greater agility and even a more agreeable voice. Instead of hoarse and raucous hootings, they pour out whistles, strong and shrill at times but so varied and melodious that they strongly remind one of the song of certain birds, particularly the white-crested jay thrush (*Garrulax leucolophus*), which is usually common where gibbons are found. At a distance their concerts are decidedly pleasant to the ear and like the other gibbons, those of Indo-China have a great variety of other expressive sounds.

As with the Hoolocks, young Indo-Chinese gibbons are born a light buff but both males and females soon turn black. When about six years old, when they become adult, females change their black coat for a light buff pelage. This change is effected gradually and is completed in six to eight months, and I have definitely established the fact by observations of many tame specimens as well as wild gibbons in Indo-China. Individual variations, slight in the black males, are of some importance in fully grown females. There are several subspecies.

* * *

Unfortunately, in public zoological collections it is not possible to keep gibbons at full liberty as I did in my Normandy park, but they can easily be confined on an island as a moat ten feet wide is sufficient to stop them if there are no overhanging branches. In cages they continually cling to the wire partitions where their poses look most unnatural and the real beauty of their actions is lost. The sight of gibbons swinging from limb to limb, often a hundred feet from the ground, jumping from tree to tree, and singing in chorus while performing a kind of frantic dance is one of the most enjoyable spectacles in nature and ought not to be, today, the exclusive and rare pleasure of a few widely travelled naturalists. We can and will put it within reach of the general public here at the New York Zoological Park.

Empire of the Ants

Less Than 130 Miles from New York City, a Colony of Allegheny Mound Builders Extends Over a Quarter of a Mile

THEODORE KAZIMIROFF

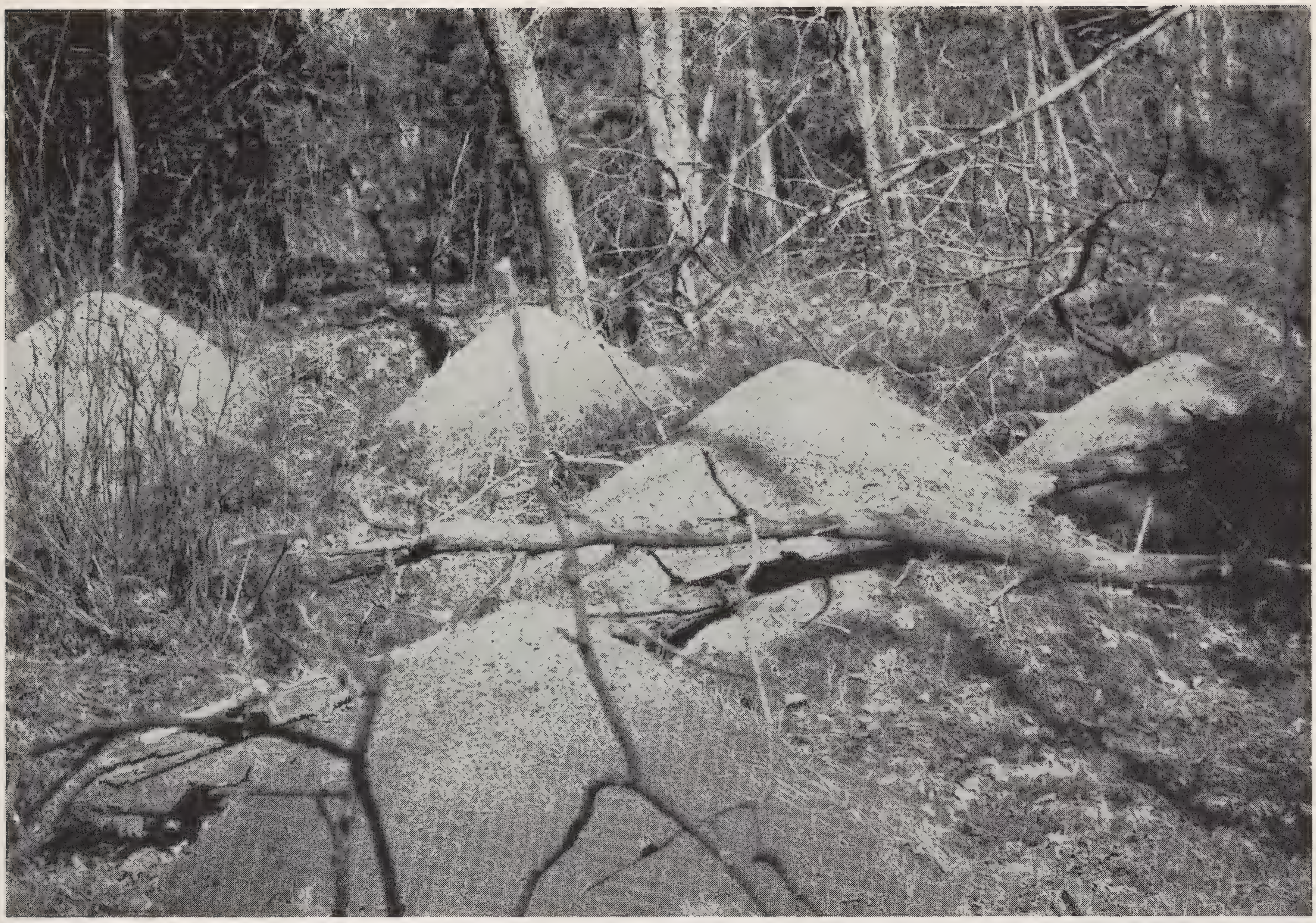
LESS THAN 130 MILES from metropolitan New York, there is a colony of ants, the extent of which is remarkable for our local species. Halfway between the towns of White Lake and Narrowsburg, in Sullivan County, nestling in the foothills of the Catskill Mountains, sprawls the vast colony of the *Formica exsectoides*. Undisturbed for years, this colony has expanded until an area approximately a quarter mile square has been covered with giant ant hills. The original founders of the colony had selected one of the most picturesque sites in the vicinity.

The colony is situated on a sloping hillside overlooking a beaver-flooded valley. Years ago several families of energetic beavers built a stick and mud dam 200 feet long, creating a half-mile backwash of flooded aspens, oaks, maples and pines. The feeder stream is a rapidly flowing trout brook that bubbles and cascades down a densely wooded hillside. Partly arched over by drooping hemlocks, then running full over slabs of rusty colored red shale, the brook flows downward in riffling cascades that plunge into deep, dark, trout-filled pools. With furious roiling boils and foam-crested riffles, the stream mellows out into the open tree-filled swamp. Flowing past and around dead and dried kingfisher perches, bubbling under the overhanging alder-laden mud banks that are emblazoned with the brilliant red of the cardinal and the blue of the blue-flag blossoms, the stream finally settles into a broad, tree-trunk-filled swamp that has patches of pond lilies and delicate nelumbos. This is the setting one sees and hears as one looks down from the ant empire.

The terrain changes within the confines of this tremendous colony. The quaking aspens that cover the slope near the beaver swamp slowly give way to an admixture of birches and high-bush blueberries. These in turn yield to the more solid growth of red maple, oak and June-berry trees. Still further up the hillside, these are replaced by the dull green of hemlock and white pines, with a ground cover of various *Lycopodia* such as ground pine and cedar, and shining and running club-mosses. Polytrichium (star-moss), maiden fern and Christmas fern also carpet the ground profusely, covering the gnarled roots of the rhododendron and mountain laurel.

Visualize every cleared area in this forest as being covered with fantastic, fairy-like domes of earth, each gleaming brightly in the sunlight that filters into these clearings, and one has a good picture of the ant empire. These great mounds are the nests of the red and black ant commonly known as the Allegheny mound builder. Although one, two or even three ant hills close together are familiar sights in the fields and woodlands of the East, I believe this is one of the largest local colonies of nests in existence.

A count taken in the spring two years ago, by Mr. John Johannson and myself revealed a total of 176 active colonies ranging from six inches to three feet eight inches in height. This excludes the hundreds of outlets which crop out at intervals among the larger mounds. These outlets range from small holes to mounds less than six inches in height, representing communicating outlets from the vast network of subterranean galleries. There were 74 recently overgrown (within a few years) and abandoned mounds that still measured more than one and a half feet in height. There were likewise numerous ancient mounds that were merely gentle rises in the



These are some of the active, "working" mounds of the Allegheny mound-building ants described by Dr. Kazimiroff, photographed in a corner of a quarter-mile-square colony of ants in Sullivan County. The ant hills ranged from small ones scarcely 6 inches high to giants 3 feet 8 inches from the base to peak. These are medium sized.

earth, covered by dense growths of grass, ferns, mosses and saplings.

The fresh mounds, those in occupancy, present a striking picture when viewed for the first time. They appear incredibly fantastic and unreal in their forest setting. They are all reddish-yellow in color (due to the predominance of red shale and sandstone) and they stand out clearly in the bright sunlight. In order to appreciate and understand the tremendous amount of labor involved in the construction of a mound, one must realize that each and every grain of sand has been transported through underground tunnels and labyrinths and carried laboriously to the surface of the nest to be deposited with the millions of other grains of sand that make up these cones. To estimate the number and extent of the tunnels and chambers thus created is an impossible task. Suffice to say that the ground within the area is honeycombed several feet in depth wherever one treads. To prove this, an upturned rock will reveal fully occupied galleries, whose occupants race about in confused indignation at being disturbed so rudely.

A section of an ant nest reveals rows upon rows of labyrinthine chambers. The nest or mound functions as a giant incubator that absorbs and retains the heat of the direct sunlight. Investigators have determined that the brood is moved about according to the amount of heat that penetrates. Thus, the development of the pupae and larvae is hastened by exposure to an optimum temperature; this is accomplished by moving the brood from east to west as the sun rises, reaches its maximum, and then sets.

The colonies each last several years, being abandoned only when overgrowth covers the nest and destroys its properties as an incubator. The mounds are slowly invaded by mosses and grasses that start growing relentlessly from the base upwards, until finally some of the large mounds give the appearance of volcanic mountain peaks with a demarcated timber line and a barren, bleak, exposed crown. Eventually, when the mound is entirely covered with vegetation, the colony is abandoned. The insulation of the grass and moss roots destroys the incubation properties and the mound becomes a deserted village reminiscent of the archaeological ruins of Mexico and Central America. The chief invaders of the ant hills are the common star moss (*Polytrichium commune*), the shining and running club-mosses (*Lycopodia*), and various grasses and ferns. In many cases, some of the older mounds are overgrown with mountain laurel and rhododendron which efface them so completely that they are almost unrecognizable as former ant-hills.

The mounds range from mere ant-holes surrounded by a few grains of sand, to a giant skyscraper three feet eight inches high by seven feet nine inches in diameter. There are eleven hills about three feet in height, while the average nests range from one and one-half to two and one-half feet in height, with a mean diameter at the base of three to four feet. In addition to the yellow-red sand and shale granules, they are liberally interspersed with twigs and white pine needles, which evidently serve as reinforcement binders. The entrances to the nests appear to be in a broad belt several inches from the base of the cone. There are dozens of tunnels emerging from this band, which is several inches in width.

The best time to study the structural aspects of the colonies is in the early spring when there is not too much vegetation and foliage, and when the ants themselves have not recovered from their lethargic winter sleep. In the latter part of spring and in the summer, it is almost impossible to observe them closely unless one is well protected with suitable clothing. As one approaches the outskirts of the area, the increase in the number of these red and black ants is very obvious. When one finally approaches the nests proper, it is at once evident that strangers are decidedly unwelcome. To do any photography, one must suffer the torture of strong, sharp-mandibled ants crawling to the attack, each one trying to reach a vulnerable spot. In a few minutes they are swarming all over one's body and are doing their best to take a sizeable bite with their powerful jaws. They attack from the ground, from the shrubbery, and even drop from the overhanging trees to repel the invaders. To fall in a faint at a time like this may very likely prove fatal, for the ants do not cease attacking unless one brushes them or plucks them off individually.

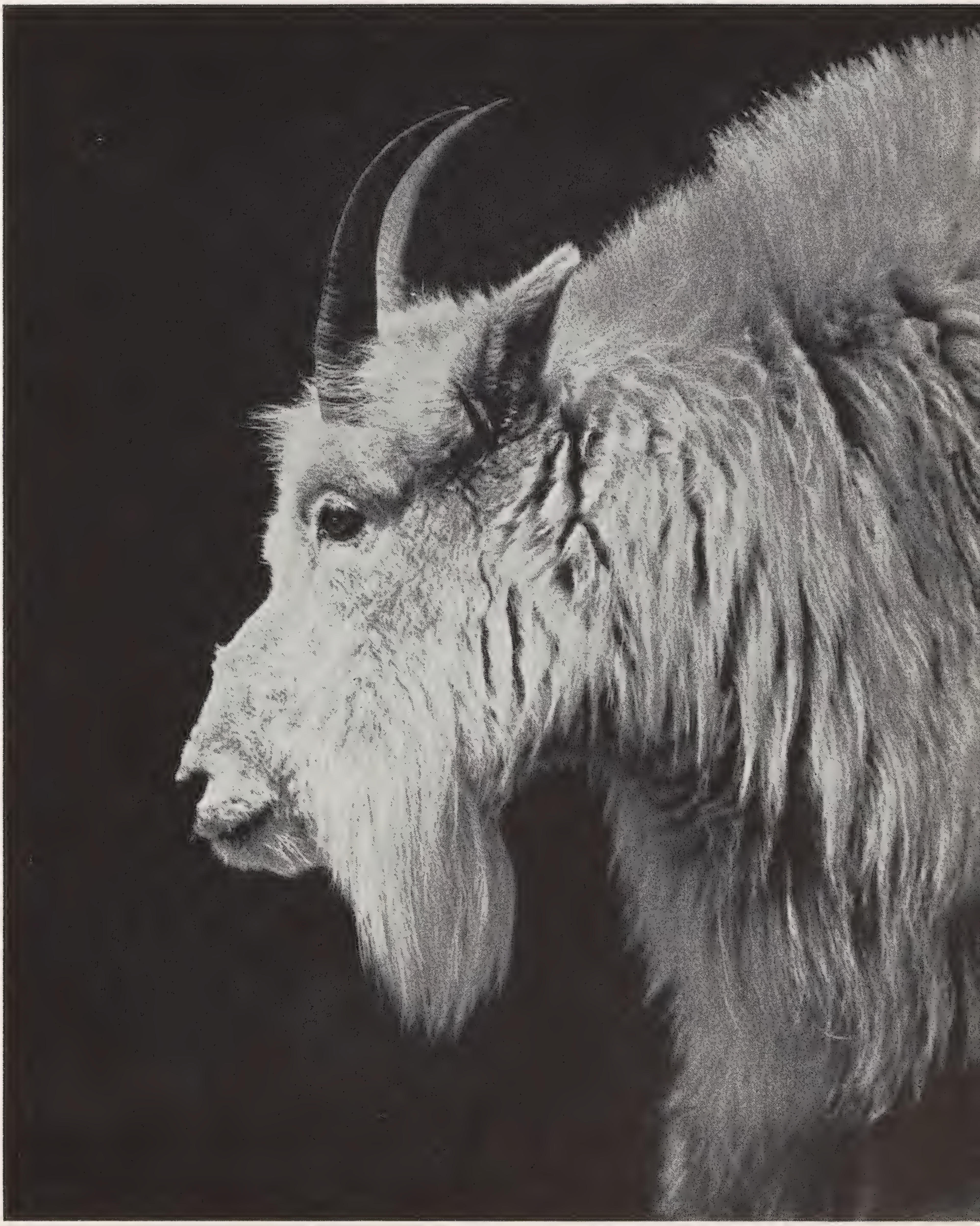
The life of *Formica exsectoides* consists chiefly in caring for the eggs, pupae and larvae in the nests and galleries; in building extensions to the subterranean chambers, in foraging for a sufficient quantity of food and in fighting off impending dangers. The only enemies and dangers aside from man, or an occasional misstep of a leaping deer, are the golden flicker or yaffle who is often seen busily flicking up ants with his long, worm-like tongue, and several species of predatory beetles that devour the pupae and larvae within the nests.

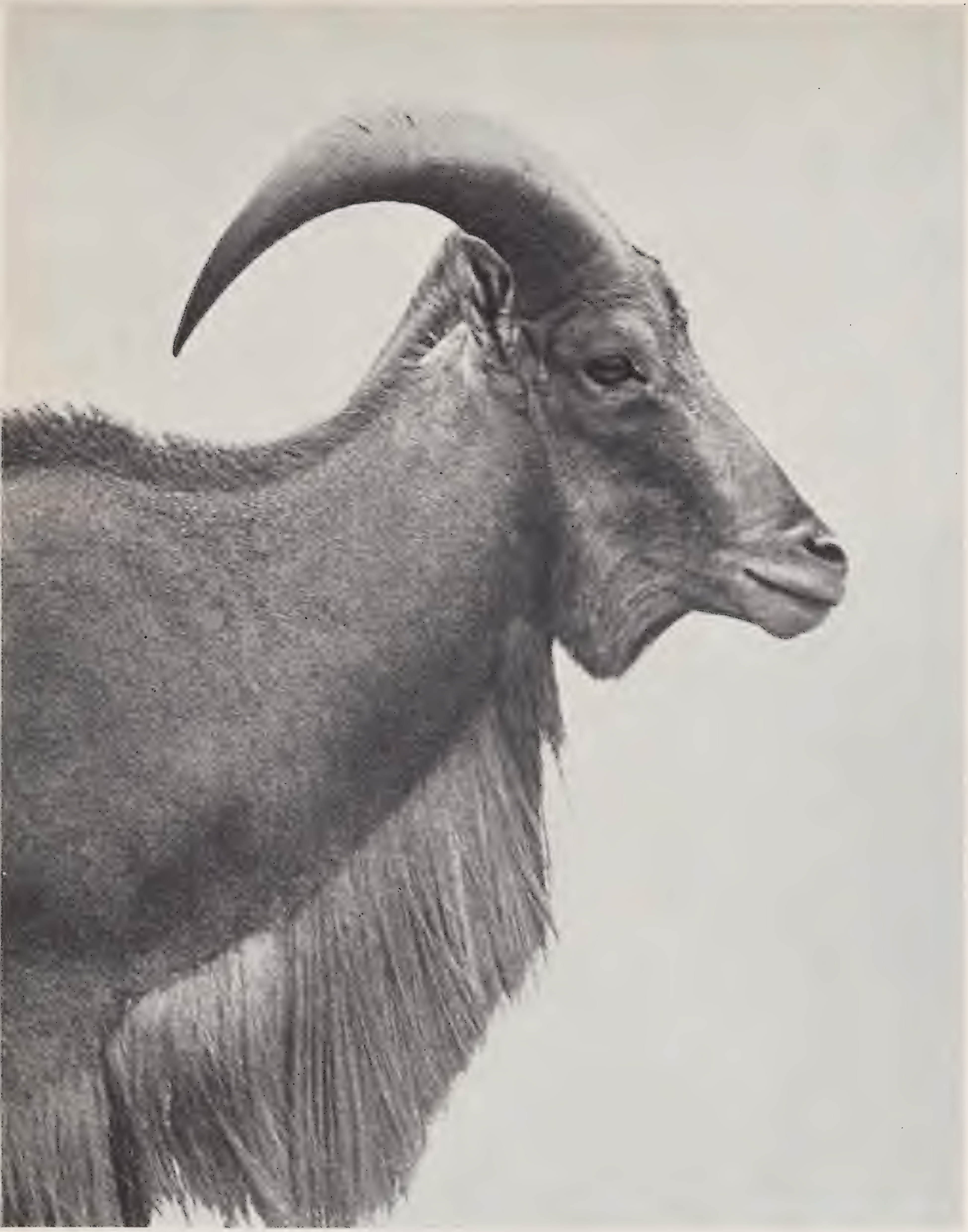
The speed with which ants give an alarm is generally incredibly rapid. As soon as a hill is approached, the advance sentinels somehow spread the warning, and the hue and cry is taken up by excited ants running erratically up and down their nests. I timed this reaction on one of my visits to the colony. In four minutes by the clock, eleven ant mounds within a radius of seventy-five feet had been notified of danger, and each was a swarming mass of red and brown ants. If one sections a mound, the workers (sexless females) are seen to begin transporting the pinhead eggs, the sack-like pupae, and the more delicate, semi-transparent larvae, to safer quarters underground. It is amazing to observe how the powerful, sharp jaws can pick up the fragile, immature ants without injuring them.

The food problem must be fairly acute in a region so overpopulated. The foraging ants may be seen for miles around dragging beetles and other insects, larvae of various kinds, worms, juicy caterpillars and anything else that is edible. A dead woodchuck placed on a nest was reduced to bones in 48 hours. It is to be hoped that these ants and their nests remain unmolested, so as to allow for complete study by the proper experts. Until recently the colony was completely isolated from all except an occasional hunter or fisherman. However, several camps in the vicinity have now constructed trails that pass dangerously close to this area, and the ant nests are thus exposed to the sometimes destructive mood of group hikers. However, it is possible that with the proper type of leadership, the entire colony may be spared for some future study by competent entomologists.

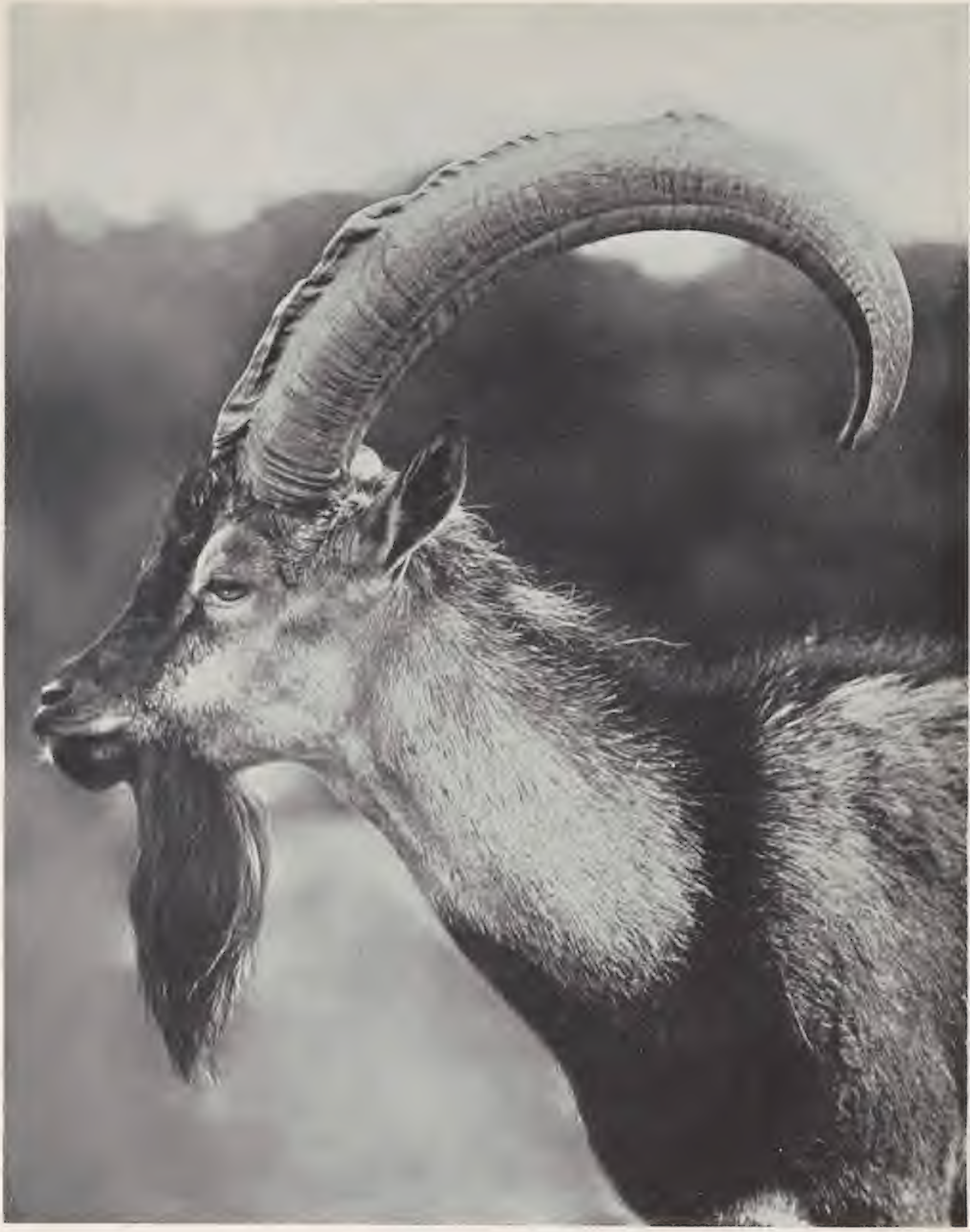
Pictures . . .

Few descriptions of the home of the Rocky Mountain Goat excel that of J. Fannin which dependable old Lydekkar published in his ROYAL NATURAL HISTORY: "Here, amid nature's wildest scenes, amid storm-swept cañons and beetling crags, amid steel-blue glaciers and snowy peaks, where the silence is seldom broken save by the rush of mountain torrent, the howling of the storm, or the crashing of the treacherous avalanche,—here, far removed from the trail of the ordinary hunter, the mountain-goat, solitary in its habits, and contented with its chaotic and gloomy surroundings, increases and multiplies."

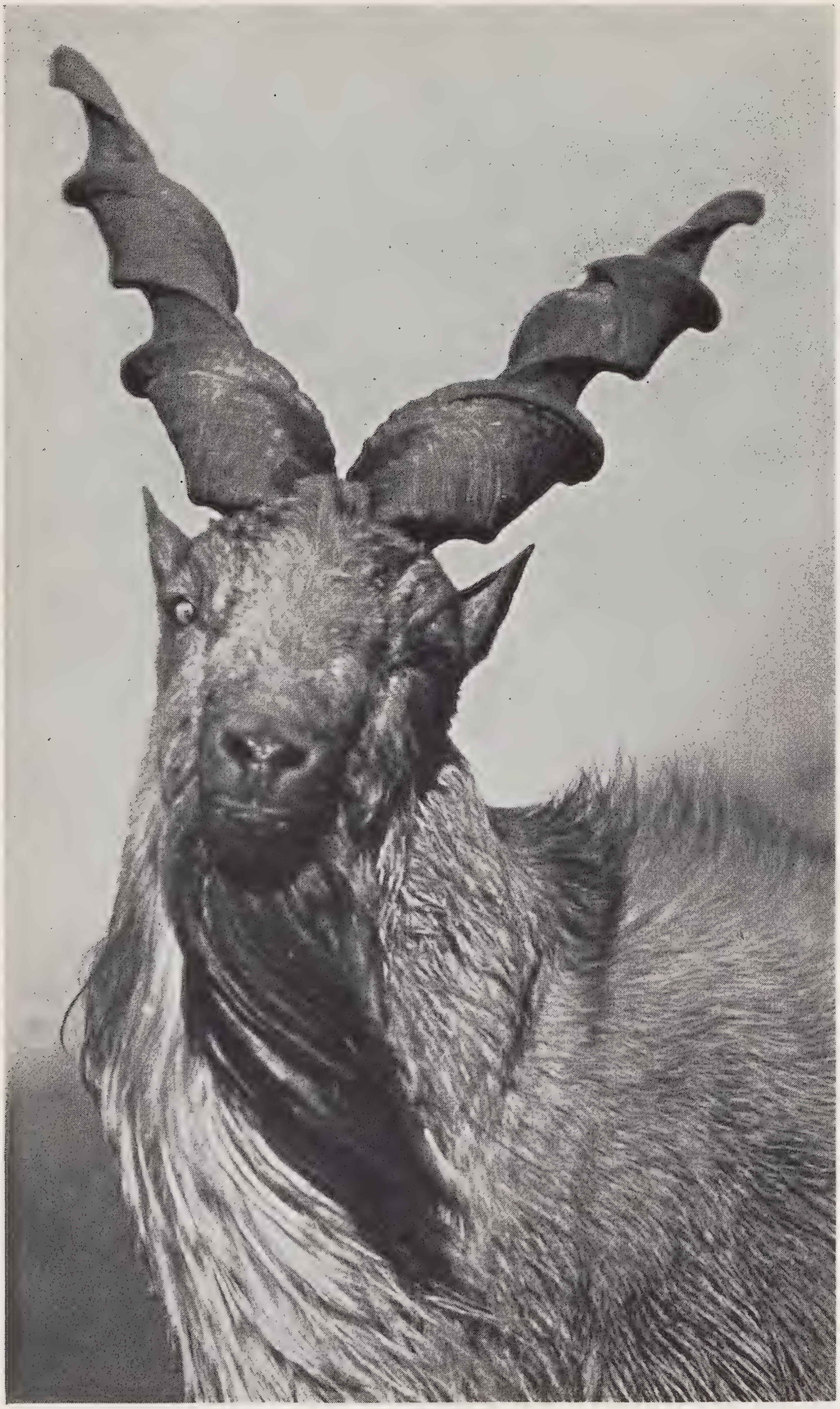




At the time of final judgment, when the sheep shall be separated from the goats, the Aoudad will probably still be a source of dispute. Structurally it is about as much one as the other. Almost all goats have a beard; the Aoudad has a modest one on its chin – but just the same, it is generally known as the Barbary Sheep. One of its really distinguishing characteristics is the heavy mane that clothes its throat, chest and forelimbs, a kind of misplaced beard. The Aoudad dwells in arid north Africa.



The Spanish Ibex is definitely one of the wild goats of the world; following the rule of thumb that the males of most goats have beards, there is little doubt about the alliance of this particular animal. The ruggedness of the wild sheep and goats is remarkable. Except at the breeding season the males and females of the Spanish Ibex live apart in large flocks and the old bucks usually seek out the highest and most exposed mountain peaks, where the snow and cold must be bitter in the extreme.



There is something proud and imperious in the bearing of the Markhor, especially in the Suliman Markhor from the eastern frontier of Afghanistan, whose horns may describe as many as two to three and a half complete corkscrew turns. Heavily bearded, statuesque, the Markhor may stand on some eminence for an hour at a time with scarcely a movement. Visitors to the Zoo, struck by the posing of the animal, have been heard to say that its horns remind them of the fantastic head-dress of Oriental dancers. "Markhor" is a native name meaning "snake-eater." Our Zoo specimens have managed for a great many years to get along on a non-snake diet, however. Hay and grain suits them quite well.

Pisces in Leo

Which Is Not the Title of an Essay on Astrology, But an Account of the Aquarium Exhibits in the Lion House

CHRISTOPHER W. COATES

For an experiment, the aquatic exhibits in the Zoological Park's Lion House are turning out very well.

It is hardly necessary to retrace all the steps by which this somewhat surprising location of an aquarium exhibition came into being – the planning of the Brooklyn-Battery Tunnel, the closing last October 1 of the old Aquarium in Battery Park, the mid-winter removal of thousands of delicate fish from the southern tip of Manhattan to the northern side of the Bronx. But the members of the Zoological Society undoubtedly will be interested in a report of some of the circumstances of the new installation, the difficulties that were encountered and overcome, the continuation of the old Aquarium's extremely valuable research activities and the public reception of the new aquatic display.

Ever since the opening on February 12 of the new exhibits in the "Lionarium," as the combined Lion House and Aquarium is inevitably being called, the wide public aisles in the building have been crowded with visitors, so much so that plans are being worked out for one-way traffic through the building. The comments of the visitors have been revealing, too:

"See the lions, Edward!" "No, I wanna see the fish."

"So that's what a butterfly fish looks like!"

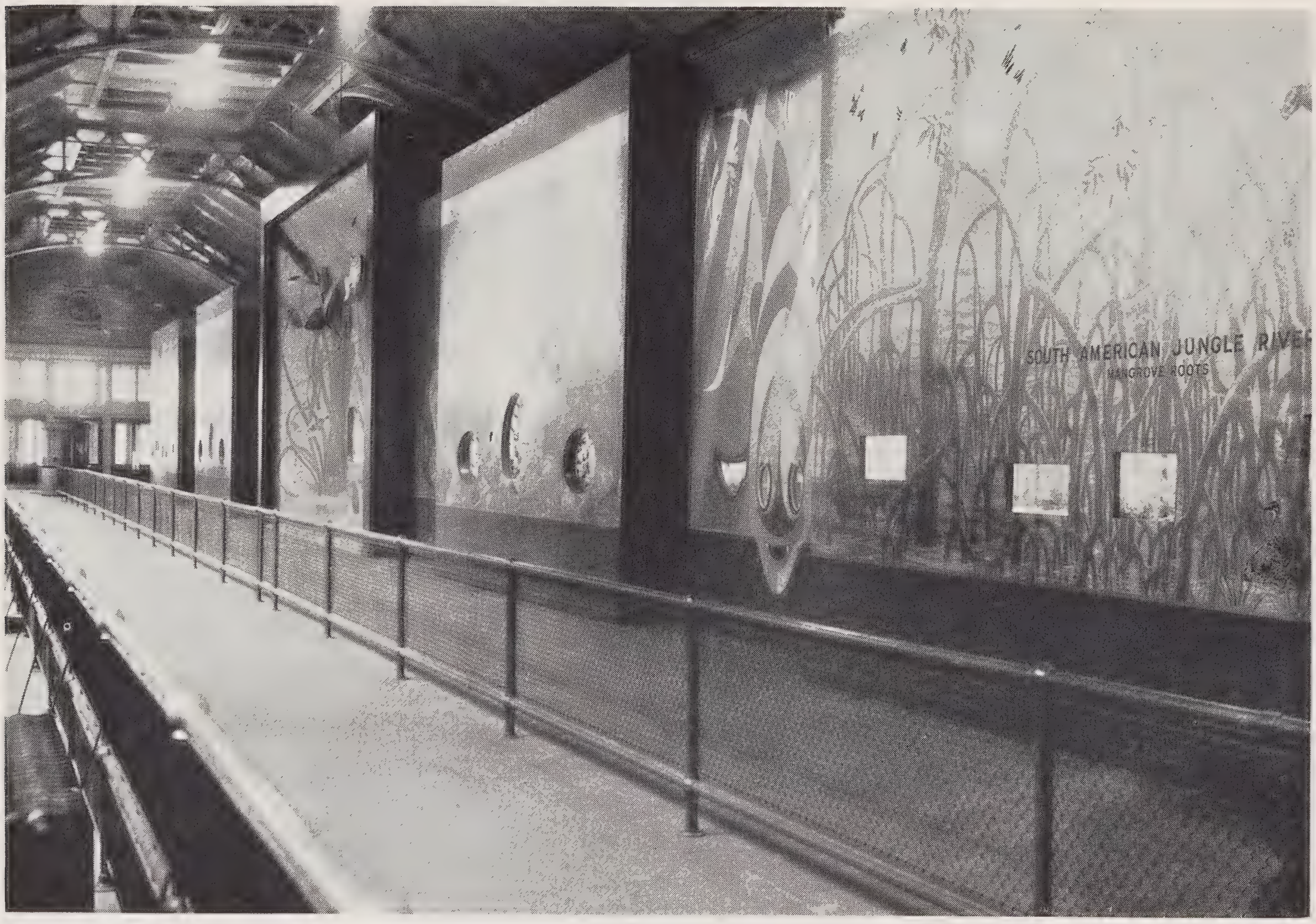
"Oh, here's real coral – what they make jewels of."

"Boy! Did they fix this place up!"

We may expect a really valuable expression of public opinion in the next few weeks as tabulations are made of the "Aquarium Questionaire" now being submitted to visitors to the building. The questionaire, through half a dozen questions, seeks to learn what the public thinks about the new methods of exhibiting fish, what features it likes especially, what changes it would suggest. Twenty-five thousand forms have been printed for distribution and the tabulated answers should be of great help when the time comes to build a permanent New York Aquarium. For the present exhibit is admittedly only temporary – a method of keeping some of the old Aquarium's choice collection of small tropical fish on exhibition in the interim between the old Aquarium and the new one that will be built when times are more propitious.

There are thirty exhibition tanks in the Lion House, set in nine mural-covered panels stretching more than two hundred feet down the west side of the building. The broken, inset-panel line of the wall provides a pleasing irregularity in the long series of tanks and the murals are generally indicative of the habitat from which the fishes come. All through the winter, while the intricate piping of the tanks was going on behind the scenes, Mrs. Helen Damrosch Tee-Van and Walter Addison toiled at the murals; Mrs. Tee-Van painted scenes representing a Malay jungle river, marine plankton, a West Indian coral reef, a South American jungle river and a scene from "Alice Through the Looking-glass," while Addison painted a coral group, a gigantic octopus, a huge tropical fish with illuminated fish-tank eyes and a large central panel designed to create the illusion that the spectators are actually inside a fish tank.

There are two special exhibits that were not present at the Battery installation – a scale model,



Looking down the corridor of the Lion House along the series of panels and the apertures of the fish tanks in the new aquatic exhibit. Many of the tanks are set at the eye-level of children. We have noticed on crowded days that the public has a tendency to line up and move slowly down the corridor, stopping for a long look at each tank.

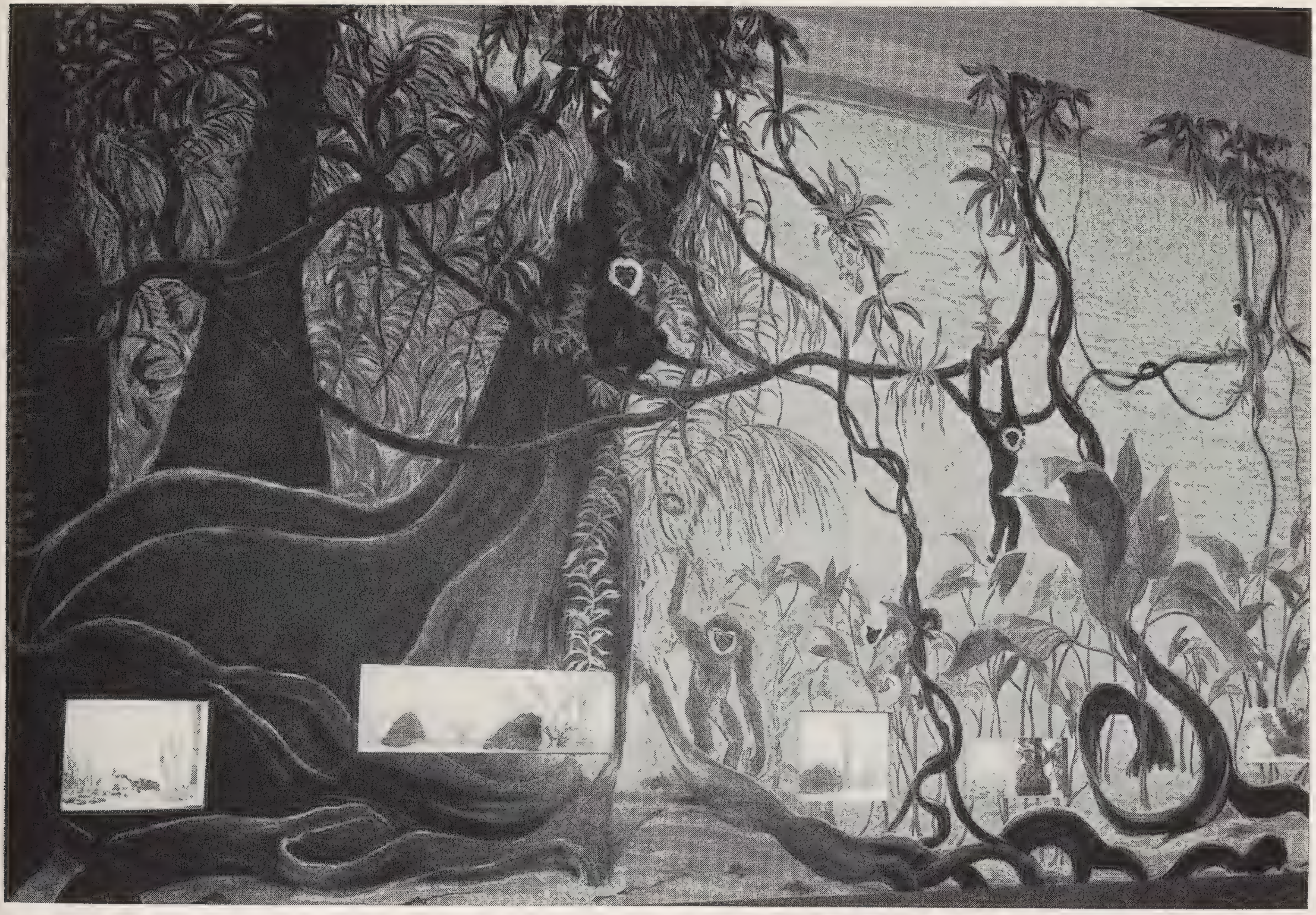
about ten feet long, of the Mexican cave visited by an Aquarium expedition in 1940 in which a series of blind, imperfectly-eyed and fully eyed fish were captured, and a working model of a salt-water circulating aquarium system containing tropical fishes.

Looking back at the past few months, the staff of the Aquarium is occasionally appalled at the size of the task it undertook in transporting so much of the old Aquarium to the Bronx.

Not only did forty-odd years' accumulated gear and equipment have to be uprooted and moved, but the most delicate of all the fish in the whole collection — the largest fish collection in the world, incidentally — had to be moved at a time of year when the only uncertainty about the weather was whether it was going to get colder. Furthermore, the water in which the fish had lived had to be transported with them; a job of some weight if one remembers that "a pint's a pound, the world around" and some of our show tanks contain as many as 600 gallons of water. Some of the Battery tanks held 35,000 gallons.

The temperature problem was solved, we thought, by heating the water an extra 25 degrees while it was still in the Battery building. This we estimated would be enough to offset the loss during transit by truck. Actually the weather turned so cold on moving day that each truckload of water lost 50 degrees en route. This loss was made up after three days of emergency reheating in the new quarters, however.

On the day the old Aquarium closed we had about 12,000 gallons of fresh — i.e., unused — sea water in reservoirs deep under Battery Park. This was water that had been hauled in from the open sea some years before and which was being kept on hand for replenishment of the salt-water circulating system. It was much less costly to pump it out of the reservoirs and transport it in Department of Sanitation flusher trucks than to get new water from the sea, of course, and so over a period of days the trucks rolled northward with some 2,000 gallons in each load. Altogether the 12,000



A close-up of one of the murals in the new aquatic exhibit and the tanks that display brightly-colored tropical fishes. This panel, painted by Mrs. Tee-Van, depicts a Malay jungle river scene and most of the fishes in the tanks are from that general region. Whenever possible, the fishes have been matched with the region shown on the panel.

gallons of unused sea-water and about 3,000 gallons of used water were removed to the Zoo and are now being circulated through the exhibition tanks or stored in reservoirs in the basement.

The most perplexing problem of all — if one problem in the ticklish process of moving an aquarium can be said to be more perplexing than another — was that of the complex piping to and from the tanks.

As aquarium people have long known, hard rubber, or glass, piping is the only type capable of withstanding the action of sea-water and the wastes from the fish without breaking down into toxic substances. Even before December 7 hard rubber pipe was costly; since that date it has been on the impossible list. Fortunately we were able to salvage enough from the old Aquarium for all our needs, for hard rubber piping does not deteriorate — at least, not with the care we give it — and there was still useable pipe that had been installed in the old building when it was first converted to Aquarium purposes in 1894. Its threads and fittings were of an old-fashioned, non-standard gauge but apart from this mechanical drawback it is still perfectly sound. The newest pipe in the Battery Aquarium was ten years old.

The older pipe, good as it was, had undergone a certain amount of twisting and distortion which did not prevent it from carrying a stream of water but did give the pipefitters gray hairs when they came to take it apart and reassemble it at different lengths. Some of the pipes and fittings were oval instead of round, and all the hard rubber was as brittle as glass. Indeed, it has to be handled as carefully as glass.

A great deal of this piping, fittings, valves and parts that were not required in the Lion House exhibit have been laid aside for future use. As an instance of the value of this salvage, a six-inch valve was, before the war, valued at about $65. Now it is simply impossible to get one.

Somehow the pieces of the gigantic puzzle that is a great Aquarium were all fitted together and in their new home the surviving fishes are thriving, certainly more beautifully displayed than was possible in the old building.

* * *

Many of the famous old specimens in the former Aquarium were distributed to other public aquariums in the East and even in the mid-West and Bermuda and the publicity and public acclaim with which they were welcomed in various cities indicate that they were, indeed, exhibitions of the very first class. Boston Aquarium was the first to send for its share of the prizes that were being distributed to our sister institutions. Boston sent a 20-ton trailer truck complete with air hoses and pumps, an auxiliary air compression tank which could be filled at gasoline stations en route — there were hilarious newspaper stories all the way between New York and Boston about the fish stopping at a gas station for air — and such miscellaneous paraphernalia as a stove for temperature control, tanks, nets and so on. Boston would have liked some of our very large sea-water fishes, such as the gigantic groupers, but their exhibition tanks were not large enough and so they had to be content with the small and medium-sized specimens.

Their shipment rolled along without difficulty, stopping at frequent intervals to rest the fishes and prevent car sickness — for fishes, like people, may become car sick, train sick, or even sea sick.

Philadelphia Aquarium was able to take the very large fish. Washington was able to handle only fresh water fishes and amphibians, as was the Baltimore Aquarium. By railway express the large turtles went to the Detroit Aquarium, and others by the Alcoa Line to the Bermuda Aquarium.

A selected collection of cold fresh water fishes, small turtles, alligators, crocodiles of two species, two species of caimans, and our penguins and sea-lions were all brought up to the Zoological Park where they are housed in appropriate buildings or pools apart from the aquarium exhibit proper.

Not all the fishes which we had hoped to save and exhibit in the Bronx survived the moving, of course, and we regret the lack of adaptability in some species which are handsome or in some specimens for which we had formed an ancient attachment. Still, some of our specimens had lived with us at the Battery for forty years and others had survived for more than a normal lifetime, so we do not feel that much more could have been expected of them.

Now that we have an experimental setup, with the possibility of working out new methods of exhibition, it is disappointing that sources of fish supply have been almost entirely cut off. Almost all of the fishes we are able to keep at present come from one war zone or another, and while theoretically we should be able to get brightly colored tropicals from Florida waters, the fishermen who normally supply such wants are now mostly engaged in another kind of fishing — for steel fish with swastika markings.

Research activities that used to be carried on in the old building on the third floor — or, on occasion, almost anywhere over the building — are still going on either at the Zoological Park or at quarters lent to part of the staff by the American Museum of Natural History. Dr. Charles M. Breder and Dr. Myron Gordon have transferred their tanks and work to the Museum; Dr. Nigrelli and myself are stationed in the Zoo — Dr. Nigrelli in an office built and equipped in a room at the south end of the Lion House and myself in an alcove behind the central panel of the exhibition wall. Other Aquarium research problems are being pursued temporarily at Yale University, New York University and the Jewish Memorial Hospital.

The Frogs of Paradox Pond

There Is a Paradox in Their Method of Growth, for They Become Smaller as They Transform from Tadpole to Adult

RAYMOND L. DITMARS

Several years ago last fall I sat on the porch of a coconut plantation house in Trinidad and combatted the cloying odor of copra with the fumes of a rank pipe while I drank in the information I was picking up from my companion.

"Down there toward the beach," he said, nodding toward a shelf of pink sand where the breakers of the Atlantic Ocean were rolling toward the sunset, "down there is something that will bring you back to Trinidad if anything will. Something I'll wager you've never seen alive, and never had in the New York Zoological Park or any other zoo. *Pseudis paradoxis.*"

I nodded. "The Paradox Frog. I know it – but only from pickled specimens in the museums. So you've got them in those ponds, eh? You're right; I'll be back in Trinidad a year from now."

And in less than thirteen months I found myself back in Trinidad, on the porch of that same house. *Pseudis paradoxis* was the magnet that drew me irresistibly – *Pseudis* and the pleasure of working once more with the kindly elderly naturalist, Professor Urich (now deceased), to whom I owed my introduction to one of the strangest amphibians in the world on that previous visit when all my spare time was taken up with the quest for the Spectral Vampire Bat.

I brought home – not a Paradox Frog, but something infinitely more interesting: the giant tadpole of the Paradox Frog. For it is not the frog itself that would draw anyone two thousand miles, lovely as it is when the sunlight strikes its iridescent green flanks and makes them shimmer like a precious stone, but the tadpole that attains the astonishing length of ten, twelve, even fourteen inches before it begins to shrink and transform into an adult form only a fifth of those lengths.

I brought back to the New York Zoological Park exactly one Paradox Frog tadpole and, although I have had many occasions in forty years of collecting and caring for animals to thank my good luck, it has seldom helped me more than this time. For this was the first time a live Paradox Frog tadpole had been available in the United States for exhibition and study – and I don't know yet why this particular one managed to live when his brothers or sisters insisted on dying almost on sight. I have handled plenty of delicate animals and the ordinary tadpole is certainly not among them, but these most interesting of tadpoles simply refused to live – some of them even for a few minutes.

The home of the giant tadpoles is near what to me is one of the most fascinating parts of a fascinating tropical island, the great Nariva Swamp. Along the eastern shore of Trinidad Cocos Bay swings in a gentle, palm-lined crescent behind which stands an unbroken wilderness of mangroves and fetid mud, infested with mosquitos, caimans and anacondas. Adjoining the swamp to the south is a rich coconut country and in the midst of the coconut palms at the wretched collection of huts called the village of St. Joseph are a few absolutely ordinary, commonplace and undistinguished ponds. "Duck ponds," we would call them in the United States. One of them, alone, is deserving of fame because it is the breeding place of the Paradox Frog, and that was the pond we singled out for an intensive search.

Professor Urich discovered the Paradox Frog in the pond and it was he who guided me there

Paradox Pond on the eastern side of Trinidad is little more than a "duck pond," fringed with coconut palms, but it contains the curious little paradox frog and its still more curious tadpoles. This photograph was taken when Dr. Ditmars seined the pond several years ago, bringing to New York the first tadpole of *Pseudis paradoxis* ever exhibited here.

the first time in 1935 when we had neither equipment nor time for seining. He, alone, had previously collected the tadpoles there and had watched a nine-and-a-half-inch specimen "grow up" by growing down. His collection of preserved specimens, at all stages of development, had fired me with a determination to collect live tadpoles myself and study them as the strange metamorphosis took place.

With J. P. L. Wehekind, whom I had known as the Professor's field assistant, I went back to Paradox Pond with a crew of native boys and a fine-meshed 20-foot seine. After a preliminary study of the pond it seemed a comparatively simple matter to bring out every living thing in it above the size of a penny, for the banks were gentle, though clogged with rank grasses and the rotting stems of palm leaves.

The first drag of the seine was disappointing — and surprising. Out of a mass of black and odorous debris wriggled an eel. It spilled out into the grass and took after the bare legs of a Negro boy. A quick blow finished it, for an eel might seriously reduce the Paradox Frog population of the pond. There are plenty of other predators that cannot be controlled so easily — small rough-eyed caimans that have wandered over from the swamplands nearby.

Another long, hard sweep of the net produced a handful of curious little tadpoles that we did not want, beautiful as their iridescent colors were. They were not *Pseudis* tadpoles, and this time we were determined to get *Pseudis* and not be put off with anything else.

Another dredge, and another. One Paradox Frog tadpole was the total result, but there was no mistaking its identity. It was small — only about three inches, and no more remarkable in its external appearance than any other tadpole — but the position of its tiny mouth was a sure indication of its species. Its mouth was at the very end of its "face," placed higher in the head than in other tadpoles. That unusual placement perhaps accounts for a habit I later noted in my single specimen, of floating near the surface of the water and by a minute wriggle of the snout seizing a gulp of air without projecting any part of its head.

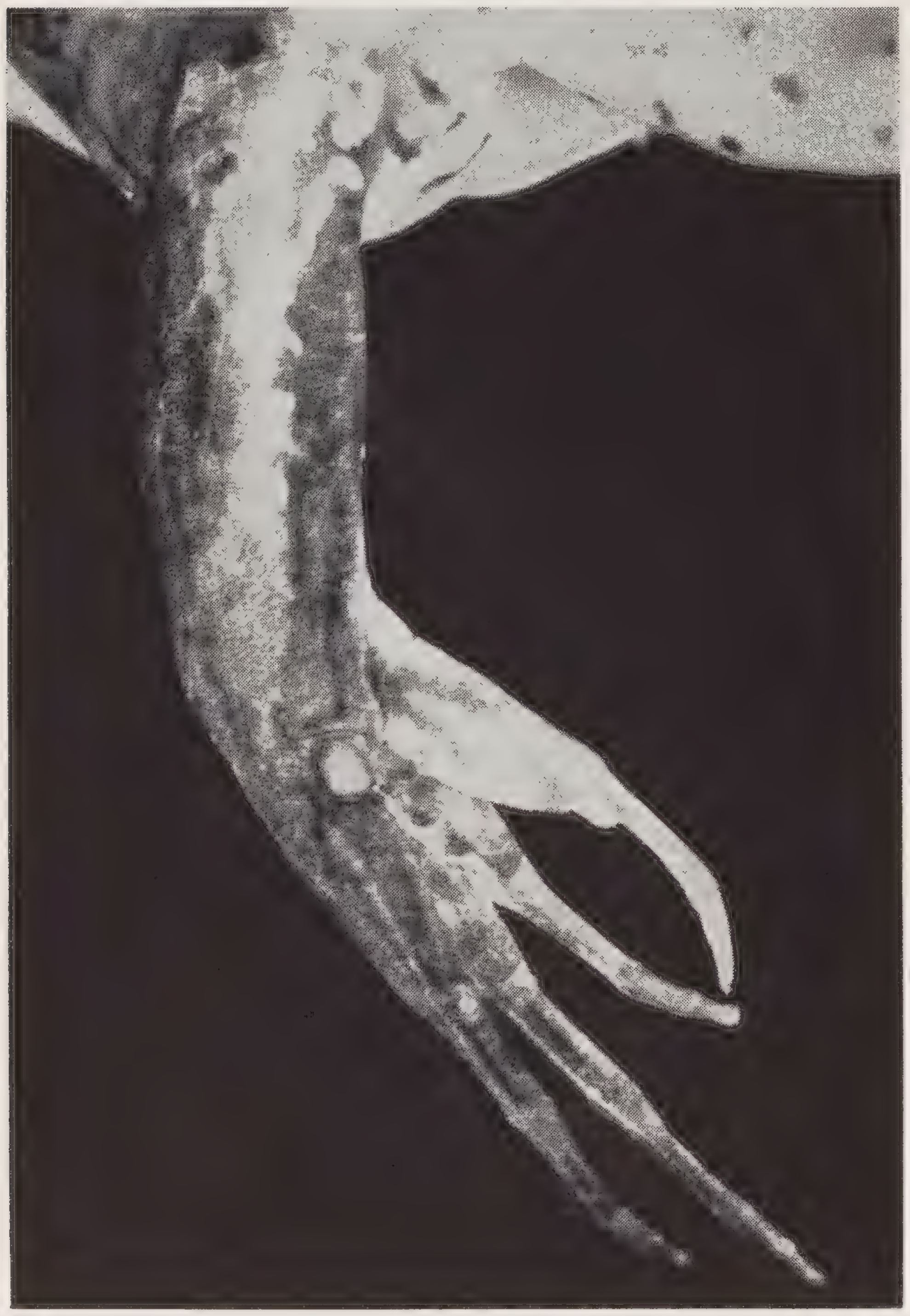
One drag on the seine followed another until, after an hour of strenuous effort, twelve Paradox Frog tadpoles were safely housed in the washtub I had carried out from Port-of-Spain. Several more we had picked out of the seine but they were dead before I could transfer them to the washtub. I recognized that as an ominous sign, but it never occurred to me that only one of the lively little creatures swimming around in the tub would survive the journey across the island a few hours later.

Along with the tadpoles our seine drew up half a dozen mature Paradox Frogs. Three came up from the very bottom of the pond, indicating that they have distinct bottom-living habits. Two I sighted along the slimy bank, but I had decided at the very beginning that I would carry away no adults. In the first place, only the tadpoles and their metamorphosis tempted me, because I wanted to keep an exact record of their changes in size, and, then, the discovery of hungry caimans around the pond made it questionable whether the Paradox Frogs would long survive if their numbers were depleted both by predators and curators. As a conservation matter I thought it best to leave as large a breeding stock as possible.

My disappointment was both keen and vocal on returning to Port-of-Spain to discover eleven of my twelve *Pseudis* tadpoles floating and dead. I can only suppose that their extreme delicacy could not withstand the shocks and sloshing they unavoidably received, for the journey across Trinidad was not a comfortable one. The incoming tide along Cocos Bay drove us far too high on the beach and at one point the only way of getting through the softened sand was to back off and charge the spot at seventy miles an hour. It was uncomfortable for me, and fatal to most of the precious cargo we were carrying.

My disappointment gave way to astonishment the morning following my return to the capital. On Professor Urich's recommendation I had wilted down four strips of lettuce and had dropped them in the pail of water where the surviving *Pseudis* was to make his home until he reached New York. Wilted lettuce, so stale that it is almost disintegrating, seems to be an acceptable substitute for the decaying food the Paradox tadpole finds in his native pond. The next morning not only were the four strips of lettuce gone, but so was most of my tadpole!

Overnight, the creature had shed more than half its tail. Originally about five inches long and a handsome, even though not extraordinarily large specimen, it appeared to be hardly half that length when I gingerly lifted the cover of the pail.



The "hand," or fore-limb, of the paradox frog, showing the "thumb" which Professor Garman found of such interest in connection with human evolution.

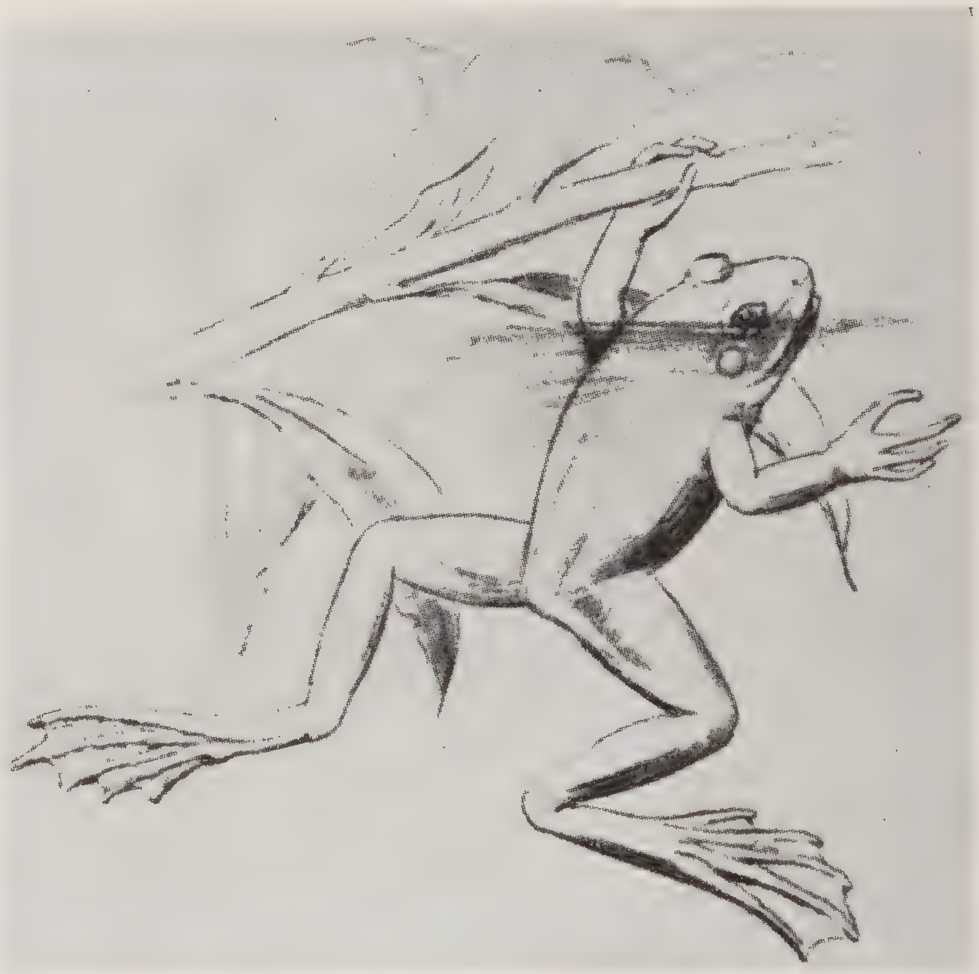
I had expected my tadpole to shrink, but not at any such rate as that. Professor Urich had seen them shrink at the rate of an inch a day — and this one had dropped two and a half inches overnight!

Exactly what took place in that small covered pail during the night I do not yet know. It is one of the mysteries, a part of the paradox, that I hope eventually to discover. That a large part of the tail was literally shed, instead of being absorbed as it should be in the normal shrinking process, I am sure, for the discarded filament was still floating in the pail and with a borrowed hairpin I spread it apart and examined it minutely. There was no doubt about it being the tail, for its shape, like a flattened cornucopia, was just the right size to fit onto the stumpy remaining tail of the tadpole.

That it was not a forcible removal I am sure, too, for the tadpole showed no sign of injury and was, indeed, even livelier and hungrier.

During the remainder of my stay in Trinidad the care of *Pseudis* was no particular problem. A few leaves of lettuce left to wilt on the windowsill were all that was needed in the way of food and the lettuce went into the pail regularly each night and just as regularly disappeared. I began to fear that, with such an appetite, my Paradox tadpole would reverse the paradox and begin to grow the wrong way.

Nature, however, functioned in a normal manner and the tadpole not only survived the trip to New York by steamer but was along toward its frog stage when it died. As the first specimen of Paradox Frog exhibited in New York, it was written about and photographed so much that the actual excitement may have contributed to its demise. In any event, it died before any extended observations could be made.



In 1877 this drawing was made by Professor Garman to show how the "thumb" of the paradox frog might be used for grasping. The drawing was extremely accurate.

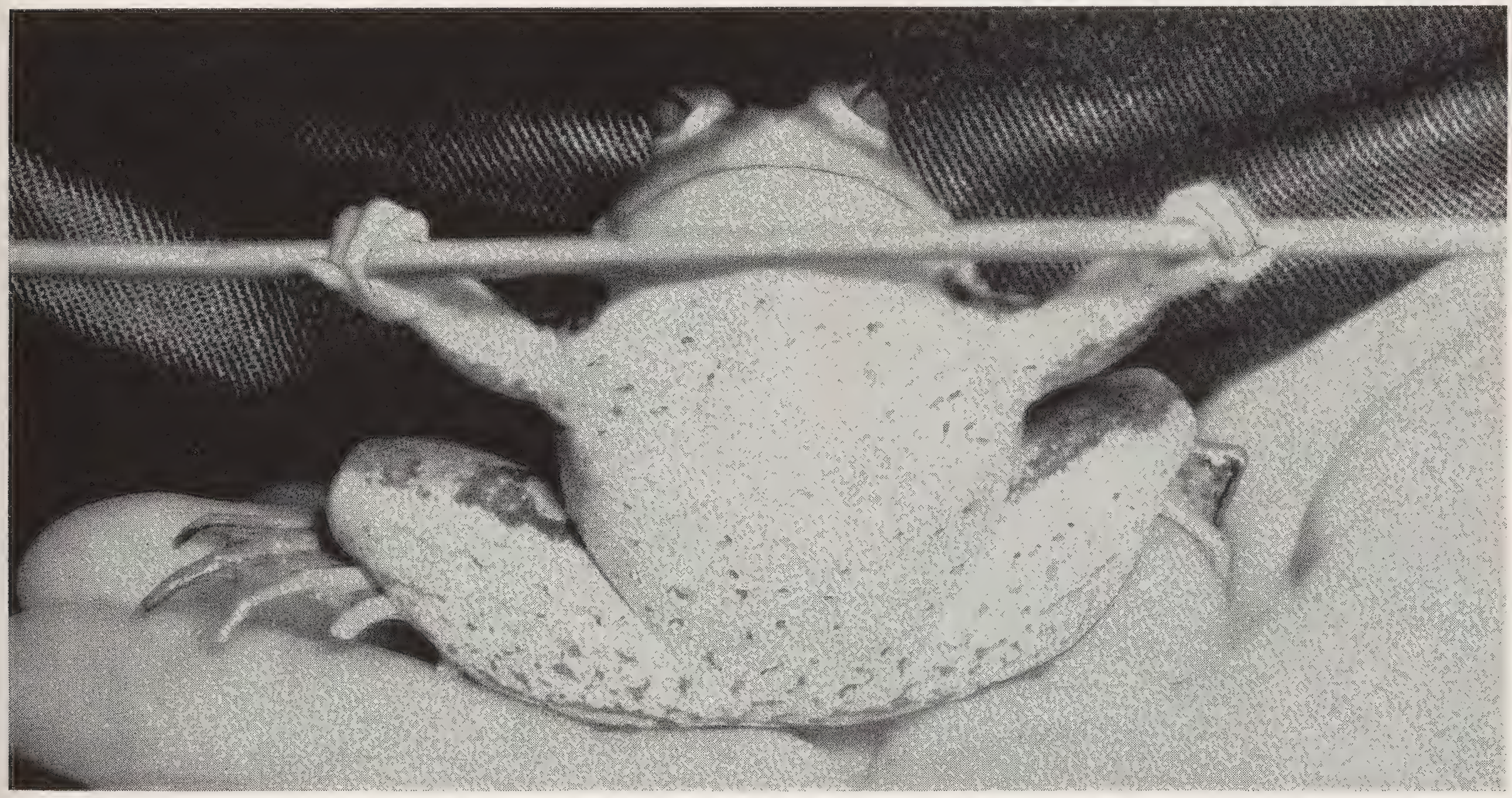
Since that first contact with *Pseudis* several years ago I have always been hoping for another chance, and it came last fall on a return visit to Trinidad. Professor Urich is, alas, no more, but I found a warm welcome at his old institution, the Imperial College of Tropical Agriculture, and with the aid of a fair part of the biological staff I managed to seine up two male frogs and two females. Since the frogs are apparently more than holding their own in Paradox Pond, this time I had no compunctions about capturing adults, especially since I hoped to be able to breed them in captivity.

As yet I have not succeeded in this aim, but have accomplished something in the way of a photographic record of the frog. The interest inherent in photographs came to mind while I was reading Dr. Thomas Barbour's "Reptiles and Amphibians." In it he presented a drawing made by Professor Samuel Garman in 1877, showing a specimen of *Pseudis* grasping a stem. From preserved specimens Professor Garman had noted the unique point of its thumb being opposable to the fingers. There is development akin to this in the tree-toads with their expanded digits, but the Paradox Frog has a plain, slim "hand." Professor Garman's drawing illustrated his theory of the frog having a grasping "hand" or forefoot which it utilized amid aquatic vegetation.

In ordinary exhibition tanks our Paradox Frogs exhibited no grasping motions. They squatted or floated like ordinary frogs. But when the frog was held in one's hand and a wire was placed against its forefeet, it immediately grasped the support and held on with a "thumb and finger" position, perfectly illustrating photographically Professor Garman's theory.

In transmitting to me Professor Garman's drawing with permission to reproduce it, Dr. Barbour appended a note:

"Garman was interested in these little frogs all his life long and often talked to me about the opposable thumb and what he believed it had meant in human evolution. The poor frogs, however, never made much of it."



The paradox frog actually does grasp a wire very much as a human hand does, as this photograph shows. As soon as the wire was placed in front of the frog as it rested on a keeper's hand, the "fingers" and "thumb" closed easily and naturally over the support. Such an ability would be useful to the frog amid underwater vegetation.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

ATTENDANCE UPSWING

Only seven of the twenty-two institutions reporting attendance figures for 1941 to the Inter-Museum Council showed an increased attendance and the New York Zoological Park was far in the lead with 3,320,313 visitors. The Zoo's 1941 attendance was 825,667 in advance of 1940 and its nearest competitor among the museums, botanical gardens and zoos reporting was the Metropolitan Museum of Art with an increase of 142,179 over 1940.

The Zoological Park's attendance increase last year was 76 per cent. of the total reported by the seven institutions showing increases.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Honorary Members

Madame Chiang Kai-Shek
Madame H. H. Kung

Annual

John A. Kelly
Russell C. Leffingwell
Col. Gordon Reel
Mrs. Estelle Stainton
Col. William Treat
Gerald F. Warburg

Junor Members

Arthur Aronoff
Leo Bauer
Herbert Bleier
Carl Ganz
Louis Hamill
Bernard Manheimer
Richard W. Munroe
John Scanlon
Julian Schorr

OUR COLLECTOR SAILS

Charles Cordier, the bird collector who brought back the magnificent series of Colombian birds in December, left for Costa Rica, Nicaragua and Honduras early in March to try to get for us specimens of the umbrella bird, quetzal, bellbird, hummingbirds and any other rarities available. If all goes well, he expected to return in June or July.

Cordier will be within the range of two species of the quetzal, but the greatest rarity he is seeking on this trip is the umbrella bird. Apparently no specimen has ever been publicly exhibited. In 1909 an English avicultural magazine reported that a specimen (which was either *Cephalopterus o. ornatus* or *Cephalopterus ornatus penduliger*) had been imported by H. C. Molineaux, a private aviculturist, but would not be exhibited. Mr. Cordier expects to collect birds in the Costa Rican range of the subspecies of umbrella bird known as *C. o. glabricollis*.

The umbrella bird takes its common name from the curious umbrella-shaped crest that covers the top of its head. A drawing of the bird seen in England in 1909 showed it with the crest erect and spread very much like an umbrella, but it actually lies much closer to the head. The bird is a fruit-eater and should be kept without too great difficulty.

* * *

Extensive remodelling of the interior of the Administration Building in the Zoological Park is now in progress and will probably be completed early in April. Administrative offices are being rearranged and a large room has been set aside for the use of members of the Society.

* * *

Raccoons have been removed from the habitat exhibit opened last year and are to be replaced this spring by a miscellaneous group of birds and small mammals.

* * *

A baby was born on March 7 to a pair of yellow paradoxures, or civets, from the Indo-Malayan area. The mother has been in the collection since 1940 and this is her third litter; three babies were born but only one survived in the third litter. The mother and baby will be exhibited in the Small Mammal House.

* * *

A mated pair of ravens — an American male and European female — which occupy a large cage near the Flamingo Terrace Restaurant, are providing visitors with a point of interest this spring. At present the birds are in the process of nest-building and the male has become jealous of the gyrations of a peacock that has been displaying outside the cage. At each display the raven knocks off work and attempts to attack the peacock. To date he has succeeded once or twice in catching the peacock's train as it brushed the wire side of the cage.

SERPENTS
of the Northeastern States

By RAYMOND L. DITMARS

Here is a comprehensive, yet compact, book about the snakes of the northeastern States that will prove to be extremely useful to everyone with a summer home or camp in that region.

This guide to the venomous and non-venomous reptiles of the New England area, New York, New Jersey and eastern Pennsylvania, is a practical and handy reference book. It gives a simple key for ready identification of the snakes, descriptions of their feeding and breeding habits, tells where they are most likely to be found, and gives photographs of every species found in the area.

The two poisonous snakes, the Rattlesnake and the Copperhead, are shown in accurate colors.

One section of the book deals with the emergency treatment of snakebite.

60 pages, 41 illustrations *50 cents postpaid*

DEPARTMENT OF PUBLICATION
Zoological Park, Bronx Park
New York City

XLV. • No. 3 MAY–JUNE 1942

0.673

ANIMAL KINGDOM

BULLETIN, PUBLISHED BY THE
NEW YORK ZOOLOGICAL SOCIETY

O BABIES, *by Claude W. Leister* • FIFTY FACTS ABOUT SNAKES, *by Robert*
hewson • FISH-EATING MAN-OF-WAR, *by E. W. Gudger* • PARK HAPPENINGS

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

ASST. TREASURER
City Bank Farmers Trust Company

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
George C. Clark
C. Suydam Cutting
Alfred Ely
Marshall Field
De Forest Grant
David H. McAlpin
Robert Moses
Fairfield Osborn

BOARD OF TRUSTEES

Class of 1943

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

William Bridges	*Editor & Curator, Publications*
Jean Delacour	*Technical Adviser*
C. J. McGahey	*Comptroller*
Harry Sweeny, Jr.	*Supt., Construction & Operation*
John Tee-Van	*Executive Secretary*

ZOOLOGICAL PARK

W. Reid Blair	*Director Emeritus*
William Beebe	*Honorary Curator, Birds*
Lee S. Crandall	*Curator, Birds*
Leonard J. Goss	*Veterinarian*
Claude W. Leister	*Curator, Mammals*
Harry C. Raven	*Associate in Anatomy*

AQUARIUM STAFF AT ZOOLOGICAL PARK

Charles H. Townsend	*Director Emeritus*
Charles M. Breder, Jr.	*Director*
Christopher W. Coates	*Aquarist*
Ross F. Nigrelli	*Pathologist*
George M. Smith	*Research Associate in Pathology*
Homer W. Smith	*Research Associate in Physiology*
Myron Gordon	*Research Associate in Genetics*

DEPARTMENT OF TROPICAL RESEARCH
William Beebe, *Director*

Jocelyn Crane	*Research Zoologist*
Henry Fleming	*Entomologist*
George Swanson	*Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE
NEW YORK ZOOLOGICAL SOCIETY

Vol. XLV JUNE 1, 1942 No. 3

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York, N. Y.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

Animal Artist

The flame of Youth's intention so frequently flickers out. Not so in the case of Paul Bransom, whose animal drawings and paintings were exhibited at the Zoological Park during May. He first appeared at the Park one day in 1908 – a boy of fifteen or so. His inquiry as to whether he could come to the Zoo and use the studio at the north end of the Lion House after school, or on Sundays or holidays, was so appealing that special arrangements were made for him. In the years that followed he came to the Zoo constantly. Staff members and keepers, one and all, became interested in him. He was so obviously determined to become "a great animal artist." His seemed the exceptional case of a young artist who did not have to go to art school to be taught how to draw – or perhaps it was that he somehow made the Zoo his own art school. In any event, he had no other tutor but himself. The years have passed and Paul Bransom has become known throughout the country as one of our great American animal artists. Those who have seen our exhibition will know why.

We are glad to record this brief story. Youth's determination fulfilled always makes good reading. Further, however, there is a "welcome sign" out to all animal painters and sculptors. The more the Zoo is used by the fraternity of artists, the better. Every possible facility is being extended to them. The art exhibits in the Heads and Horns Building have been extremely popular with the public. These art activities are more than a side issue with us. We hope they may increase as the years go on.

Fairfield Osborn

THE COVER

Baby Red Foxes are little anomalies; they look like very young kittens, but they bark like tiny puppies! Our two foxes, born in the great Medical Center as Dr. Leister tells in Zoo Babies, *are thriving in the Zoo and have become quite accustomed to being picked up and photographed. Our photographer's only difficulty was in keeping them awake long enough to have their pictures taken after they had been playing all morning.*

EAGLES

Our striking series of pictures of a Golden Eagle in flight, from perch to hand, were taken by Arthur Sasse of the staff of International News Photos, one of the country's outstanding news photographers, and permission to use them in Animal Kingdom *was kindly given by By-line Pictures.*

THAT DUCK

Too late to be included in the article, It's Nesting Time Again!, *word came from the Lion Island that the Mallard duck that apparently abandoned her nest in the shelter of the barberry bush has returned, and is again incubating her eggs. So, after all, we may have a second brood hatched on Lion Island, within a few feet of the lions themselves.*

IN THIS ISSUE

Baby Red Foxes . . . . *William Fitz, Jr.* COVER
Zoo Babies . . . . *Claude W. Leister* 59
Physalia, the Fish-eater . . . . *E. W. Gudger* 62
Eagle Flight 67
Questions Everybody Asks About Snakes. I. . . . . . *Robert Mathewson* 71
It's Nesting Time Again . . . . *William Bridges* 75
Behind the Scenes: News and Notes 79

YOUNG RACCOONS INVESTIGATE THE WIDE WORLD

Zoo Babies

This Spring's List of New Arrivals Is the Largest in Several Years, and It Includes a Number of Rarities

CLAUDE W. LEISTER

NEARLY A YEAR ago the directors of several of the largest zoological gardens in the country held a meeting in our Zoological Park to discuss the imminent shortage of animals caused by the withdrawal of ocean transportation. One of their conclusions was that American zoos should encourage the breeding of animals already in their collections — that they should, in short, become self-sustaining as far as was possible.

Like so many other ideas, this one was good in theory but at the time we thought it might be difficult to put into practice. In recent years we have had comparatively few mated pairs of animals. Furthermore, several of the western zoological gardens which have been unusually successful in producing and rearing young had developed special nursery facilities — places where the mothers and babies could be given complete seclusion during the all-important hours and days immediately after birth. We had plans, and hopes, but little more.

In the light of what has happened this spring, it almost appears that special facilities are not of the great importance we thought them, for the springtime crop of animal babies in the Zoological Park is the largest in many years — and it includes, to our joy, a number of important rarities.

We did, of course, acquire breeding pairs of several animals during the latter half of last year and they and some of our older stock came through handsomely! Naturally, we are inclined to believe that we might have done even better if we had a special "nursery" in some secluded part of the Zoological Park, but for a beginning, we are well satisfied.

In order of their arrival, these are the baby animals born in the Zoological Park this spring:

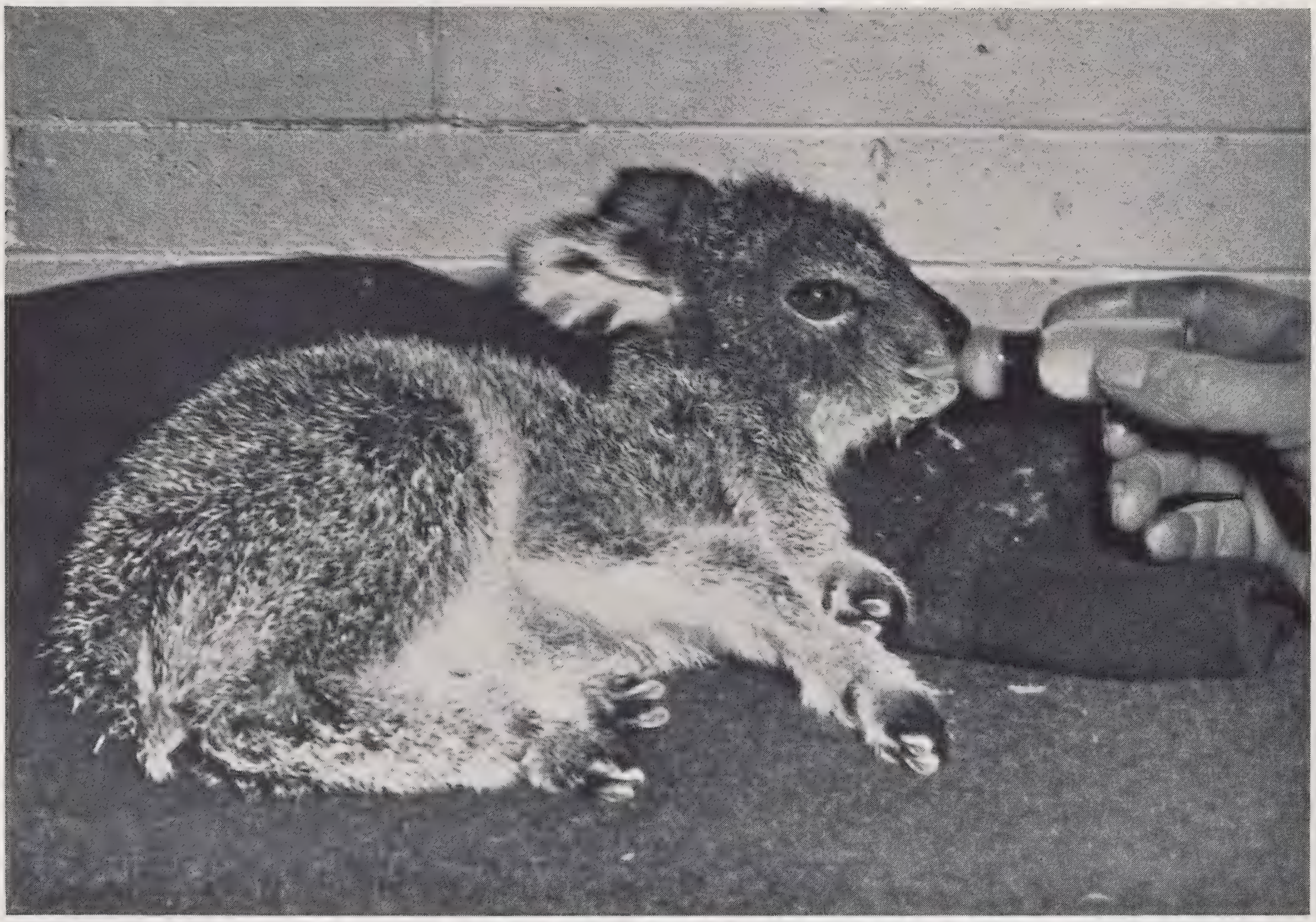
March 7 — 1 Masked Palm Civet (*Paguma larvata*).
March 15 — 3 Raccoons (*Procyon lotor*).
March 24 — 2 Red Foxes (*Vulpes fulva*).
April 15 — 1 Reindeer (*Rangifer tarandus*).
April 22 — ? Cape Hunting Dogs (*Lycaon pictus*).
April 24 — 3 Binturongs (*Arctictis binturong*).
April 24 — 1 Reindeer (*Rangifer tarandus*).
April 29 — 1 Indian Black Buck (*Antilope cervicapra*).
May 1 — 1 Klipspringer (*Oreotragus o. oreotragus*).
May 5 — 2 Lions (*Felis leo*).
May 5 — 1 Reindeer (*Rangifer tarandus*).
May 6 — 2 Coyotes (*Canis latrans*).

This list does not take into account such springtime staples as aoudads, Barasingha deer and the like, which can be expected with the regularity of clockwork whenever spring rolls around. Nor does it extend beyond the first week of May and it is quite possible that by the time this article appears in print, there will be other newcomers in the collection.

It will be noticed that on April 22, the date on which the Cape Hunting Dogs were born, the number of babies is represented by a question mark. At the time of writing, nearly three weeks after the birth of the puppies, we are still not sure how many of them we have, despite the fact that they are undoubtedly the prize Zoo babies of the spring.

The parents came to us in August of last year

JUN - 1 1942



Soon after its birth it became apparent that the baby Klipspringer was too weak to stand and nurse, and consequently it has been bottle-fed by its keeper. The baby has the same gentle but alert face as its parents. When it gets strong enough to go outside, it will find a newly-built rock mound where it can demonstrate its climbing ability.

as part of a collection of African animals made on our order by Albert M. Vida. We had exhibited the oddly-colored, almost hyaena-like Cape Hunting Dogs several times previously, but this is the first time we were fortunate enough to obtain a litter of puppies.

The parents were quartered in the Kangaroo House, and when it became apparent that a birth could be expected at almost any time, a closed box shelter was provided for the mother. Since then she has rarely come out of the box, except to feed or to utter her chattering, howling bark at her keeper when she judged that his cleaning of the cage was a threat to her babies.

On two or three occasions, however, she has exhibited some of her family outside the box. Generally early in the morning or late in the afternoon, Keeper James Rimmer has seen three babies playing with the mother; from the sounds inside the box at the same time, he knew there was at least one other. He believes there were five or six in the litter.

One baby died; its body was found outside the box about two weeks after the birth of the litter. It was covered with short, glossy black hair on the back and head, with grayish spots on the belly and a white-tipped tail. The parents have the white tail-tip, but otherwise are a queer conglomeration of colors — black, gray, brown and yellow.

There is little doubt that in popular, if not in zoological, interest, the baby Klipspringer will be considered the chief prize of the spring crop of Zoo babies. Few of the antelopes have the grace and delicacy of this South African animal, and the baby is a perfect replica in miniature of its handsome parents. This is the first baby of the kind we have ever had, although several of them have been reared in the St. Louis Zoological Garden from which we obtained the parents.

The baby was weak at birth, and unable to stand and nurse. It seemed unlikely that the mother would be able to keep the baby alive, so Keeper Rimmer went into action. Over a period

Like all fawns, baby Reindeers are adept at concealment and at remaining quiet even though an intruder is within a few feet of them. This baby, the first of the three Reindeer born in the herd this spring, chose a spot among dead leaves where his dark coloration made him conspicuous; he never moved until the photographer touched him.

of months he had made great friends with the Klipspringers until he was able to go into their compartment and stroke them. Their trustfulness in their keeper proved to be useful in caring for the baby; the mother permitted Rimmer to hold the youngster up to nurse, and also to carry it out of the compartment to feed from a bottle. At this time it is still uncertain whether, with all our care and Keeper Rimmer's personal interest, we will be able to rear the baby.

Baby Red Foxes are another novelty in our collection and apparently, from the amount of interest they have aroused among visitors, few persons had ever seen a fox baby. It was only by chance that the babies are in the Zoo. When the old and unsightly Wolf Dens were torn down this spring, it was necessary to dispose of the animals that could be replaced easily, and the fox collection was presented to a physician at the Medical Center for the furtherance of certain of his special studies. A few weeks later we received a hurried telephone call from him: one of the foxes had produced a litter of puppies and the Medical Center lacked nursery facilities for baby animals. Would we take the mother and babies back again?

We would, of course – we were delighted to have them. And so the mother fox and her two pups are on exhibition in the Small Mammal House.

Although Red Foxes have been standard exhibition animals for many years, this appears to be the first time that young have been born to them here.

The young Reindeer are most welcome additions to the collection, not only because they enlarge our herd but because their birth seems to indicate that Reindeer *can* be kept under Zoo conditions in a normal and healthy manner. The four Reindeer, a buck and three does, which were obtained shortly before Christmas, were the first we had exhibited in many years and it was almost taken for granted that Reindeer would not thrive in this climate. But they do.

Physalia, the Fish-eater

The Portuguese Man-of-War Sails the Tropic Seas and Discharges Its Stinging Batteries When Small Fishes Touch Its Tentacles

E. W. GUDGER

American Museum of Natural History

A LITTLE FISH swimming or floating near the surface of the sea is forever at the mercy of enemies in the air above and in the water beneath. It needs shelter, and it needs it desperately. A box, a board, a piece of driftwood, a bit of floating sea-weed, is a place of refuge and a godsend. Presently a shadowy form floats by; from it trails a tangled cluster of "vines." It might be — to a fish's eye it looks like — a bit of Sargasso weed. Into the "vines" the little fish darts, and that is the end of the fish. For the "vines" are the stinging, paralyzing tentacles of Physalia.

* * *

Physalia is no doubt known under its picturesque common name of the Portuguese Man-of-War to many persons who have never seen the creature. Unfortunately, it must remain a name only to almost everyone except those who cruise in tropic seas or live along tropic and subtropic shores, for Physalia is so extremely sensitive to mechanical shocks and to even faint traces of unusual chemicals in the water that it is virtually impossible to keep it alive in aquariums. But if technical ingenuity can devise a method of exhibiting this hollow-bodied marine animal, it is to be hoped that the technicians will attempt the job when a new aquarium is built in New York City, for Physalia would certainly repay the effort that would make its close study possible.

I well remember the first Physalias I ever saw — at Sand Key, some miles off Key West, many years ago. From the low bow of a launch, the only part of the animals that could be seen were the pneumatophores, or gas-bubbles, that floated on the surface and were driven hither and yon by every stray breeze. Steering in close, I lifted one of the shimmering bubbles to examine the great cluster of tentacles and zooids on its lower surface. These were its organs for catching and eating food and for reproduction.

This was my only contact with Physalia during four seasons in the Florida Keys and at the laboratory of the Carnegie Institution of Washington at Tortugas, and during ten summers at the laboratory of the U. S. Bureau of Fisheries at Beaufort, N. C., I never saw Physalia even once. They occur only seasonally, and even then spasmodically, so it may be judged how difficult it is to study the habits of these fragile and sensitive creatures.

Only a few students of marine life have seen Physalia catch and eat fishes, and their accounts are widely scattered in scientific books and journals. In recent years I have spent some time searching out the few accounts quoted in this article; no other attempt has ever been made to bring the data together.

* * *

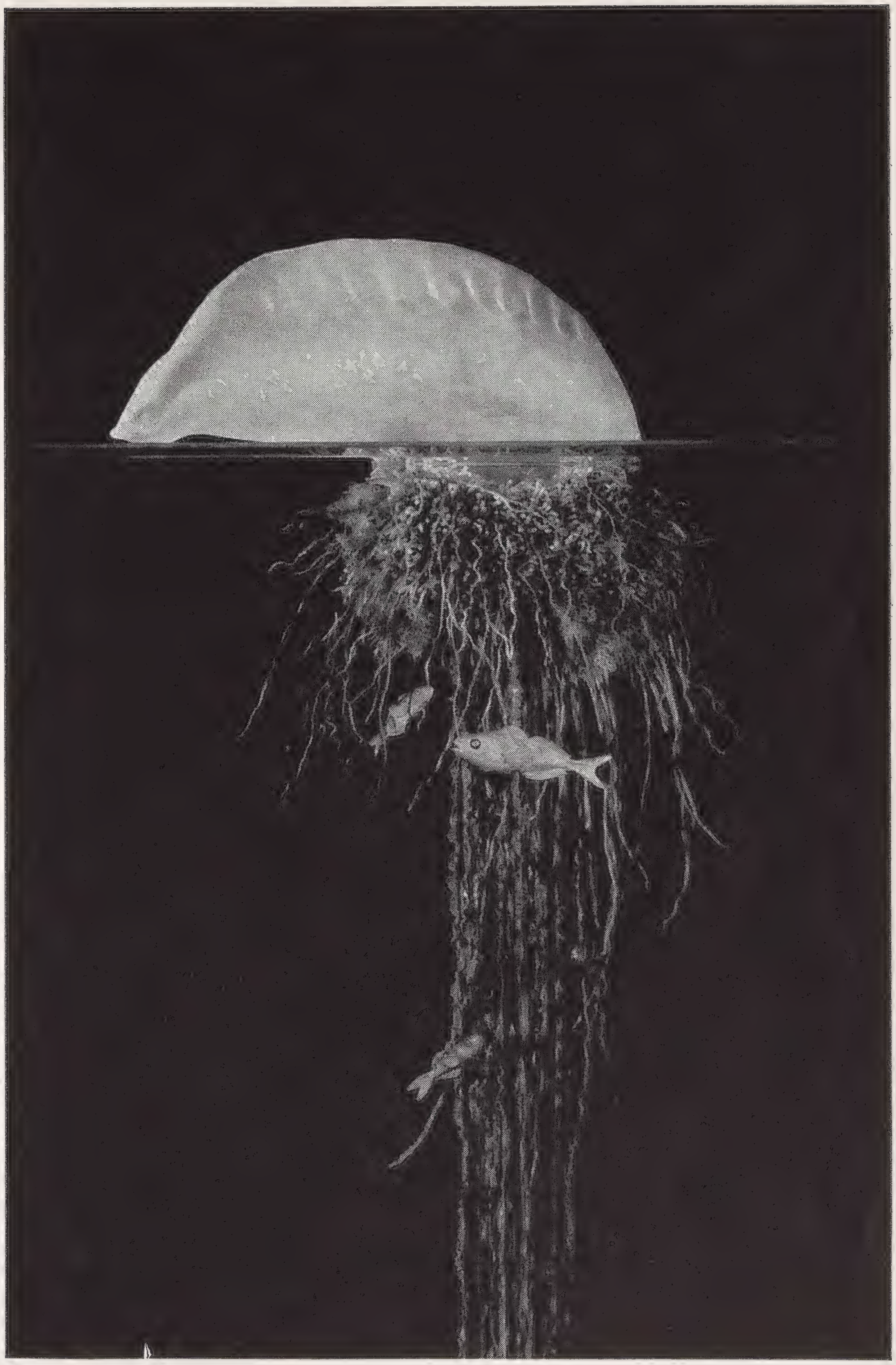
Some fifteen years ago Prof. G. H. Parker[1] reported some of his studies on the physiology of Physalia which he made at Key West.

"In the blue waters below their diminutive hulls, the long delicate tentacles with their deadly nettling cells stream out many feet like

---

This is the third of a series of articles recounting the fishing proclivities of the lowly, hollow-bodied marine animals known as Coelenterates. Article No. 2, "Jellyfishes as Fish-eaters," appeared in the *Bulletin* for March-April, 1934.

[1] Parker, George H. 1928. The Shepherd Fish and its Strange Pasture Lands. The Remarkable Association between the Fish, Nomeus, and the Portuguese Man-of-War, Physalia. Nat. Hist., **28**, 53-57, 2 figs.



To a fish, the long, flowing tentacles of Physalia might very well resemble a clump of dangling sea weed. But, as this model shows, a fish that made one such mistake would very likely never make another. On the surface of the water is the floating air bladder; the zooids dangle from it in the water. This is a photograph of a model in the American Museum of Natural History.

anchor lines. Almost transparent and of the tint of the blue sea water itself, one of these tentacles may be struck by an unwary fish. Instantly, batteries of nettle capsules are discharged with the double result that the fish is made to adhere to the tentacle at the same time that it is seriously poisoned. Its struggles excite the tentacle to shorten and thus the victim is drawn up nearer to the clusters of sucking mouths. Its movements, moreover, bring it into contact with other tentacles, in this way making its capture doubly certain. Sooner or later the fish, if not too large, is entirely overcome by the poisonous injections and is drawn up within range of the numerous mouths which spread their trumpet-shaped lips generously over the benumbed prey so as to cover it entirely. Digestion proceeds in this semi-external position and the resulting juices and fragments of the partly digested fish are sucked up by the mouths and elaborated as food for the man-of-war as a whole. It is not unusual to find Portuguese men-of-war with the remains of several partly digested fishes still held to the undersides of the float. Sooner or later these are cast off, for the jellyfish certainly catches many more fishes than are necessary for its food. . . . Thus in all respects the Portuguese man-of-war is an admirable death trap for small fishes."

Of all the jellyfishes in southern Florida, Physalia is most dreaded by bathers. If the stinging tentacles strike the body of a swimmer, thousands of the nettle cells penetrate the skin and pour out their poison. Intense stinging, poisoning and swelling follow, and from a heavy enough dose a swimmer may be almost paralyzed for some time. Many an incautious swimmer can testify to the power of Physalia's tentacles and thus their effects on small fishes could be surmised even if there were fewer eye-witness accounts than there are.

The earliest first-hand statement of the fish-killing activities of Physalia goes back 118 years to 1824. In 1817, the French Government sent the corvettes "Uranie" and "Physicienne" on an exploring voyage around the world. The results of this three-year voyage were published in seven quarto volumes. That volume dealing with the zoology of the voyage was written by two scientific men, Quoy and Gaimard, who made the collections. In speaking of Physalia, they say: "We know that physalias feed on fishes for we have several times seen them suck up and digest the little fishes which had received shocks from their fiery tentacles."[2]

Lesson, in his great work on the Acaleph Zoophytes,[3] says that Physalia nourishes itself on fishes, "tel que scombres, maquereaux et avocets." He personally observed that fishes which improvidently ran into its tentacles were quickly killed. He saw fishes as strong as a herring killed and eaten, but flying fishes were the special prey of the Physalia.

George Bennett, in his delightful "Gatherings of a Naturalist in Australasia,"[4] figured in color and described a Physalia from Australian waters. Of its feeding habits he writes that

> ". . . having one day captured a specimen in my towing net, I observed entangled by the tentacles some little fishes (among them a small *Centronotus niger*). . . . On placing them all together in a tub of sea-water, the Physalia, being apparently very hungry, immediately seized the fishes entangled in its grasp, and the process of feeding by absorption was distinctly observed. The tubes to which the suckers were attached were soon seen to be filled with portions of the fish, readily to be distinguished through their diaphanous coats by the silvery hue imparted to them."

Thirty-nine years later (1899) another Australian scientific man, E. R. Waite,[5] confirmed Bennett's observation. Waite was acquainted with the sanguinary habits of Physalia and in addition he reports that his friend, T. Whitelegge, had often seen small fishes entangled in the tentacles of Physalia or found in its stomach or siphon organs.

The scientist, who had had the best opportunity to study under laboratory conditions the fish-eating habits of Physalia, was R. P. Bigelow. In August 1889, considerable numbers of this coelenterate came into Vineyard Sound, on the southern coast of Massachusetts. Bigelow brought numbers to the aquaria of the Fish Commission Laboratory at Woods Hole and studied their habits. None, however, could be kept alive longer than ten days, even when fed regularly.

---

[2] Quoy, J. R., & Gaimard, P. 1924. Zoologie (in Freycinet, L. de. Voyage autour du Monde sur les Corvettes. . . . "l'Uranie et la Physicienne" pendant. . . . 1817-20). Paris (Physalia catching fishes. p. 561).

[3] Lesson, Rene P. 1843. Histoire Naturelle des Zoophytes Acalèphes. Paris. (Physalia feeding on fishes, pp. 547-553).

[4] Bennett, George. 1860. Gatherings of a Naturalist in Australasia, etc. London. (Physalia and its fish-eating habits, pp. 5-12, col. pl.)

[5] Waite, E. R. 1899. Scientific Results of the Trawling Expedition of H.M.C.S. "Thetis"—Introduction. Australian Memoirs **4** (Physalia feeding on fishes. p. 15).

Several specimens when brought in had partly digested fishes in their siphons. Other fishes were held fast by the mouths of many siphons. Minnows put in jars with a Physalia would soon come in touch with a tentacle and would succumb. The tentacles tended to encircle the fishes. When a fish was secured, the siphons sucked themselves fast to its side and the process of digestion began.

Here follows Bigelow's careful summary of his observations. In this he makes us see the details of what takes place out in the open sea when Physalia catches its prey. The picture is a vivid one.

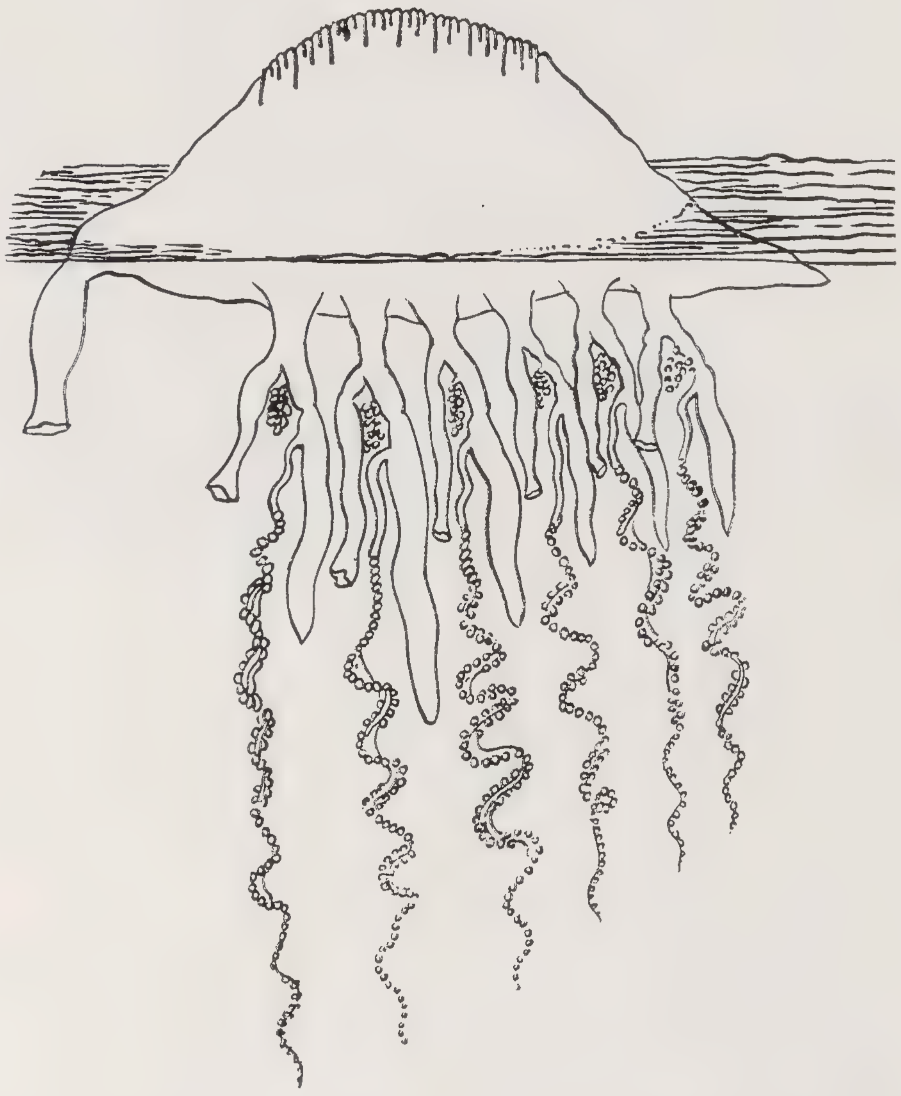
> "For food this animal catches small fishes. It floats there on the sea, quietly waiting for some heedless individual to bump its head against one of its tentacles. The fish, on striking, is stung by the nettle cells and fastened, probably by them, to the tentacles. Trying to run away, the fish pulls on the tentacles. The tension on its peduncle, thus produced, is a stimulus on some center there, which sends an impulse along the tentacle that causes it to contract. The fish in this way is drawn up so that it touches the sticky mouths of some of the squirming siphons, or feeding polypoids. As soon as the mouths, covered as they are by a gluey substance and provided with nettle cells, touch the fish they stick fast, a few at first and gradually more. The mouths open and their lips are spread out over the fish until they touch, so that by the time it is dead the fish is enclosed in a tight bag composed of the lips of a dozen or so of siphon mouths. Here the fish is digested. As it begins to disintegrate, partially digested fragments are taken into the stomachs of the attached siphons. When they become gorged they detach themselves from the remains of the fish, the process of digestion is completed in the stomachs, and the nutrient fluid is distributed through the hollow pedicles and peduncles to the other parts of the animal."[6]

* * *

At the beginning of this article I described the tragic fate of a small fish seeking the fatal shelter of Physalia's dangling tentacles. Now I close with a somewhat similar picture, but with a different ending.

If one lifts a Physalia out of the water, a number of beautiful little fishes are likely to dart wildly about with panic-stricken, erratic movements. Cross-barred with the same purplish color that one sees on the tentacles of Physalia, they seem to harmonize in color with the much larger jellyfish, but their association is much more than aesthetic. These fishes, *Nomeus gronovii* by name, live under the floating pneumatophore and swim unharmed among the deadly tentacles. They never voluntarily go any distance from their host and home. They have no other home.

Nomeus has long been thought to possess some charmed immunity to the poisonous nettle cells and, in return for this protection, to lure other fishes to destruction. Other fishes, chasing Nomeus, strike against the tentacles, are paralyzed, and are drawn up to the nutritive zooids and eaten. Any "leftovers" are thought to be eaten by the Nomei.



The mechanism of Physalia can be seen more clearly in this diagrammatic drawing than in the photograph. The compound organisms below the float become more numerous as the colony grows older. Each cluster is composed of a finger-like tactile organ, a reproductive organ looking like a cluster of grapes, a long stinging tentacle, and a feeding polyp with an open mouth. The drawing is from Miner, after Delage-Heroud and Haeckel.

The matter of this curious association is of sufficient interest to warrant going into it further, and on looking up the literature I have found some very curious things. First, as early as 1896, Samuel Garman[7] declared that this immunity is at least sometimes wanting. He states that, "On several occasions Physaliae have been taken with partly digested Nomei in their grasp, which would indicate that the little fishes were sometimes preyed upon by the 'men-of-war.' " These observations were made at the Dry Tortugas, Florida. I spent four seasons there but, alas, I did not see a single Physalia and had no opportunity to study this curious association.

---

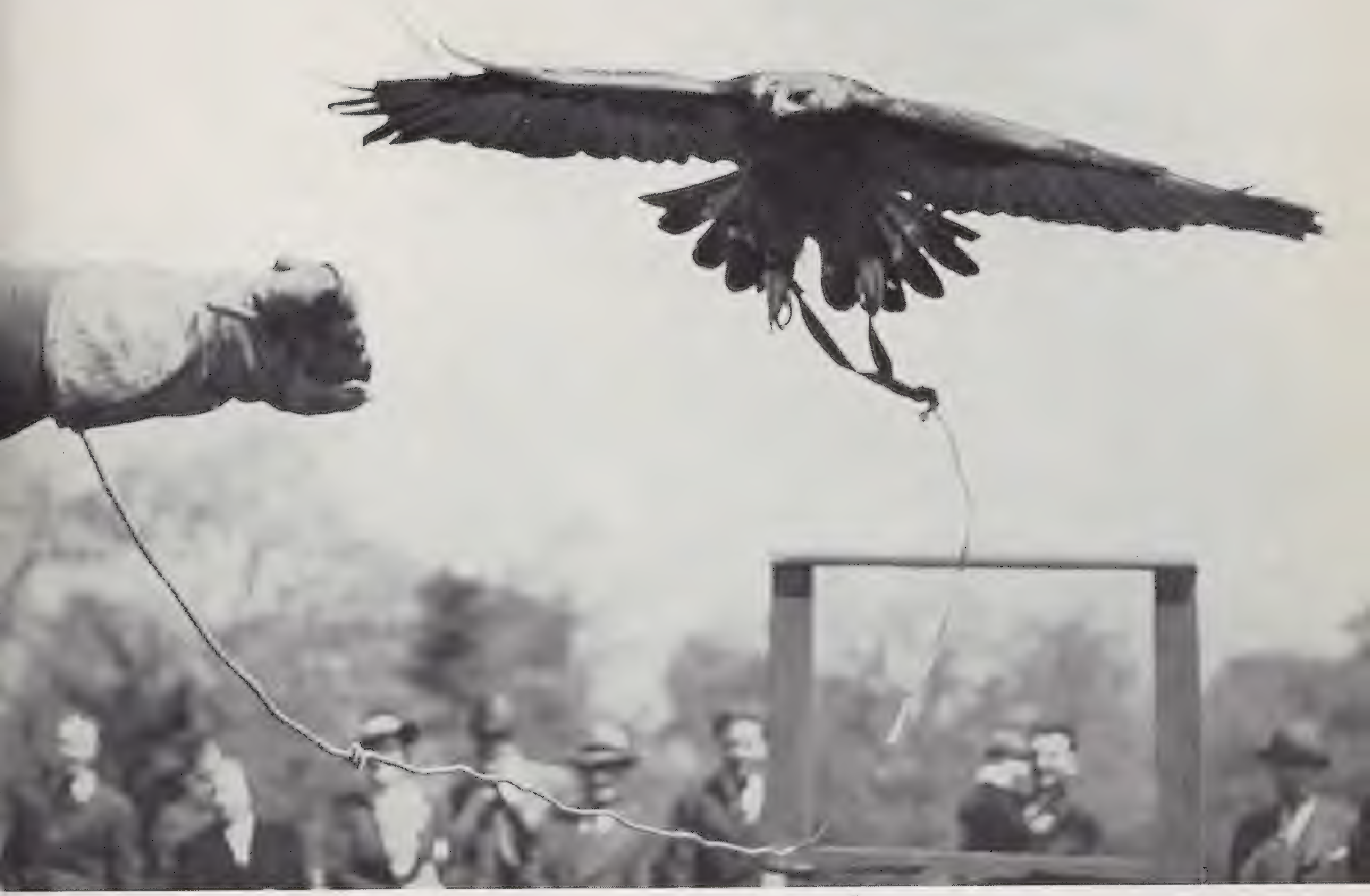
[6] Bigelow, Robert P. 1891. Notes on the Physiology of *Caravella maxima* (*Physalia caravella*). Johns Hopkins Univ. Circulars, **10** (no. 88), 90-93, fig.

[7] Garman, S. 1896. Report on Fishes collected by the Bahama Expedition of the State University of Iowa. Bull. Labs. Nat. Hist. State Univ. Iowa, 4, (*Nomeus gronovii* eaten by Physalia, p. 81.)

That there is another side to this behavior of Nomeus and Physalia is attested by the observations of a Japanese scientist, Kojiro Kato.[8] In 1933, at the Mitsui Institute of Marine Biology near Shimoda, Japan, he had opportunity to study a very unexpected and unusual phase in the relationship of Nomeus and Physalia. As a result of his investigations, he asks the question —"Is Nomeus a harmless Inquilinus of Physalia?" Now, the designation "inquiline" (as the dictionary tells us), is from an Italian word meaning a lodger. As to this relationship, Kato answers his query, as follows: "While watching carefully these animals [in the sea and in an aquarium], I soon found that, contrary to what had been written by previous writers, the fishes were vigorously attacking the Physalia from below, eating indiscriminately various zooids, together with the tentacles." Then, to check up on the matter, Kato sectioned the stomach of one of these fish and identified in it the unmistakable tissues of Physalia. Perhaps these little fish were ravenously hungry. At any rate, in this game of tit for tat, they retaliated on Physalia for dining on their brethren.

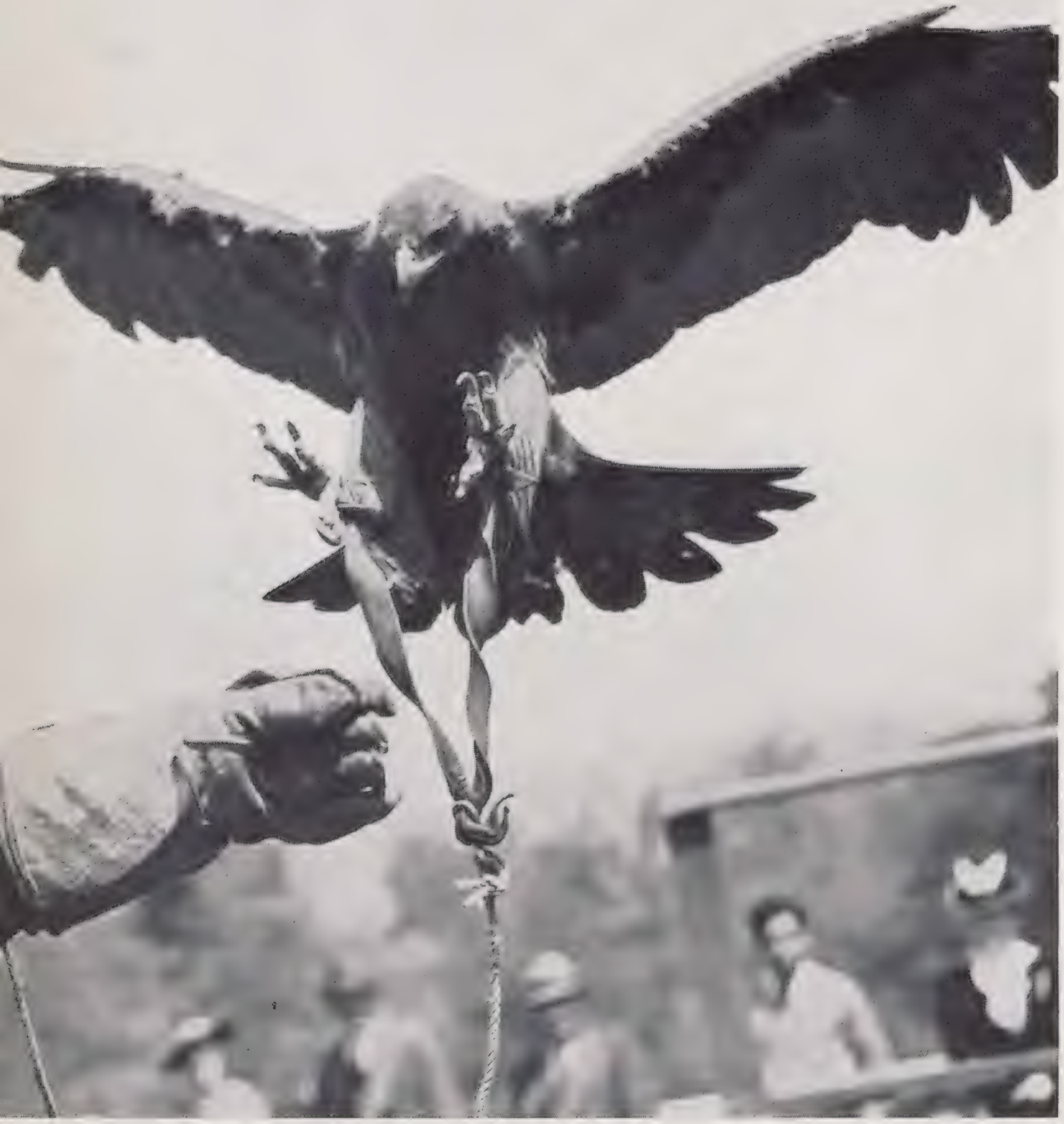
---

[8] Kato, Kojiro. 1933. Is Nomeus a harmless Inquilinus of Physalia? Proc. Imp. Acad. [of Japan], **9**, 537-538.



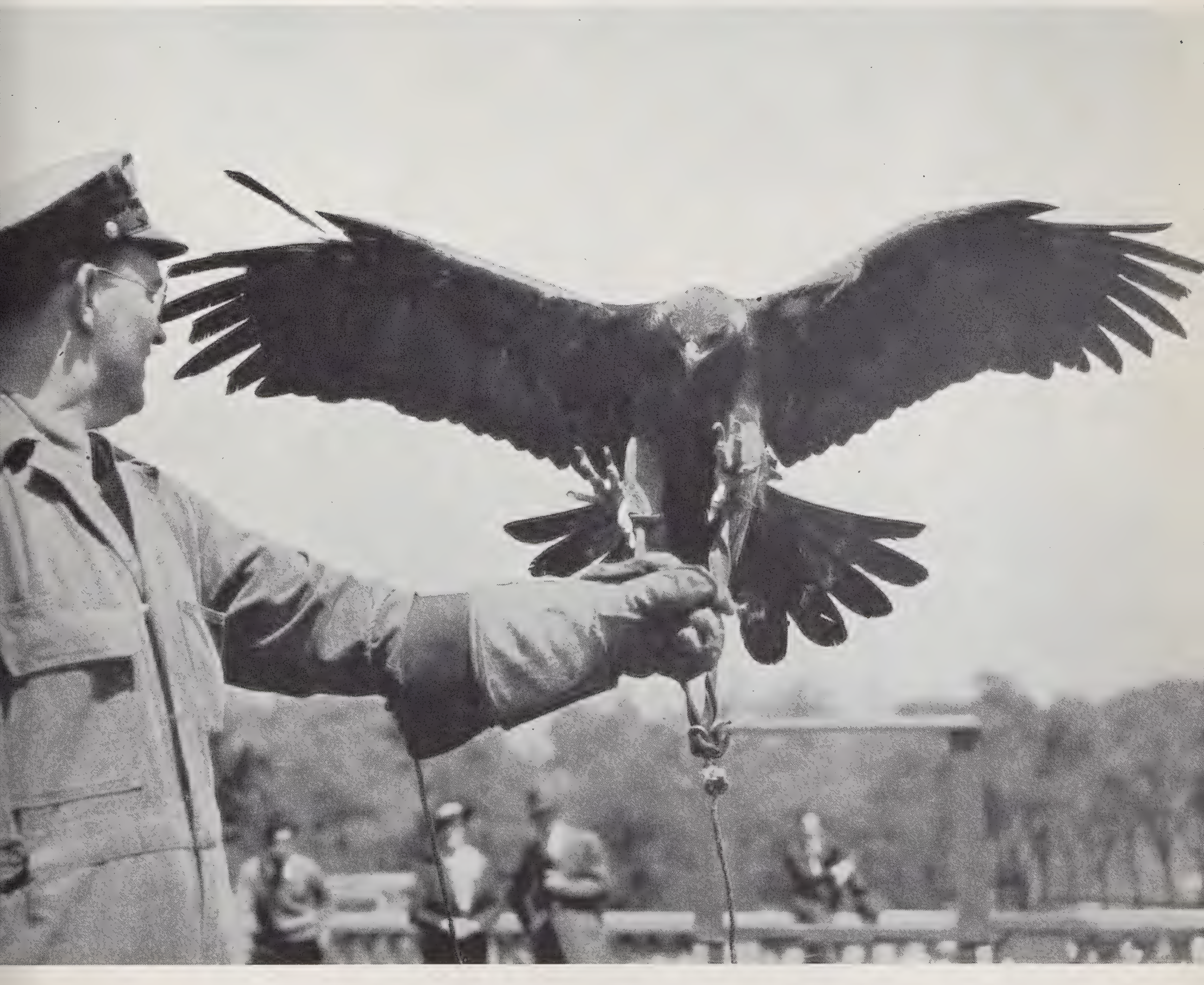
Photos Courtesy By-Line Pictures—INP—Sasse

This wild-caught American Golden Eagle came to the Zoological Park in the fall of 1940, after being caught in a wolf-trap in Montana. The following spring Keepers Grebe and Kraft began training the bird to fly from their wrists to a perch some 25 feet away, and back again to their wrists. Here the Eagle is in full flight. The trailing cord prevented it from flying away.



An Eagle about to land comes in low and rises just before making the landing. The bird's "thumbs" at the upper ends of its wings spread at this moment, to spill air and soften the landing. From observation of this mechanism, the slotted wings of airplanes are supposed to have been designed.

In landing position. The Eagle has risen slightly as he approaches his landing place and his body momentarily falls back, with the feet extended. As he makes contact, his body tilts forward and he comes to rest on an upright keel. The whole operation of making a landing is a fascinating study in delicate adjustments and balance.



ON
PARADE

Questions Everybody Asks About Snakes. I.

The Staff of the Reptile House Takes Stock of the Inquiries by Visitors About the Lives and Habits of Serpents.

ROBERT MATHEWSON

[EDITOR'S NOTE: The author of this article is one of the staff in the Reptile House in the New York Zoological Park. During the past year he has kept a record of the hundreds of questions put to him and other members of the staff by visitors. Believing that they reveal such a genuine interest in the lives and habits of snakes—and in many instances such a lack of real knowledge—he has made a compilation of the most frequently asked questions, and has answered them in terms as simply and popularly expressed as possible. For the sake of brevity, little effort has been made to go into explanations and exceptions. This is the first of two articles that will answer 100 questions about snakes, and later the material will be published in a small booklet.]

1. *What good are snakes, anyway?*

Like all living creatures, snakes have to eat—and a very large proportion of snakes eat rodents that are harmful to man's interests. It has been estimated that rodents, chiefly rats and mice, destroy $200,000,000 worth of foodstuffs each year in the United States. Anything that preys on rats and mice is consequently a good friend of man.

2. *Are all snakes poisonous?*

No. There are about 2,450 species of snakes in the world and only about 175 kinds are considered dangerous. Another 75 are poisonous, but are so rare or so small that to all intents and purposes they are not dangerous to human beings.

3. *Are all snake poisons alike?*

No. Generally speaking, there are two kinds of snake poison: a kind that attacks the nerves of the victim (neurotoxic is the technical term for this type, and Cobra venom is an example), and a kind that attacks the blood cells (haemotoxic; Water Moccasin venom is an example).

4. *Is snake poison used for anything?*

In recent years some very important uses have been found for snake venom. What might be called a negative use is the employment of venom of various types to make anti-snakebite serums. A positive use is the employment of the nerve-attacking type of venom to relieve certain kinds of pain, and of the blood-attacking type to halt some kinds of bleeding.

5. *Is a snake's forked tongue poisonous?*

No. Its tongue is just a tongue—something to taste with. When a snake sticks out its tongue, it gathers taste sensations which are registered on a special organ in the roof of the snake's mouth.

6. *Is there a kind of snake that can sting you with the end of its tail?*

No. Some snakes have tails which end in a horny spine, but it isn't particularly sharp and it isn't poisonous and it can't "sting." Some snakes use the spine as a kind of probe while they are feeding.

7. *Is a snake's breath poisonous?*

No. This is a silly myth that probably started in the Middle Ages or before, with yarns about dragons that breathed fire and pestilential gases.

8. *Can a snake "spit" poison?*

The so-called Spitting Cobra and certain others of the Cobra family can spray venom up to ten feet, with fair accuracy. This ability probably comes in handy as a means of blinding a prospective victim while the snake closes in for a bite.

9. *What snake has the deadliest poison?*

It's a hard question to answer, but a good guess is the Green Mamba of Africa. In the main it feeds upon birds, which it seeks in trees and bushes. Possibly its poison has to work fast and kill its prey before it can fly far, or the serpent might have to travel a long way to reap the reward of its labor.

10. *If you are bitten by a poisonous snake, does it do any good to hold the bitten part over your head?*

No. This idea comes from an old belief that poison only travels upward. Actually, venom is distributed through the body by the bloodstream and the lymphatic system.

11. *Is snake venom still poisonous after it is extracted from the snake?*

Yes. Venom that has been extracted and properly dried so that it doesn't spoil, is nearly as poisonous as it was when it was first extracted as a liquid.

12. *Is snake poison good for anything except serum and medicine?*

Not much, in civilized countries. The American Indians are supposed sometimes to have poisoned the heads of their arrows with snake venom.

13. *Is whisky a good remedy for snakebite?*

No. On the contrary, it is bad, for it acts as a stimulant and causes the blood to circulate more rapidly, thereby carrying the poison more rapidly through the system.

14. *Is there some plant that is a remedy against snakebite?*

The savages in many tropical countries think so, but scientists haven't been able to find such a plant.

15. *Is it a good idea to sear a snakebite with a hot iron?*

It's about the worst thing you could do. The main idea in treatment of snakebite is to get the venom out, by suction, and searing the puncture helps seal it in.

16. *If you split a chicken open and apply it to a snakebite, will it draw the poison?*

No. The idea that the carcass of a freshly-killed animal has drawing powers seems to be a very ancient one, but the carcass has no effect on a snake bite. Real suction, by the lips or a mechanical suction device, ought to be applied.

17. *Can you tell a poisonous snake by its triangular or diamond-shaped head?*

No. This is not even a good "rule of thumb" way to tell a poisonous snake from a non-poisonous one. Some of the world's most dangerous snakes have blunt, rounded heads — and some of the most useful and harmless citizens in the snake world have triangular heads. The Water Snake of the Northeastern States is an example of the harmless, triangular-headed kind.

18. *Are all heavy-bodied snakes poisonous?*

Not at all. The Cottonmouth Moccasin and the Green Water Snake are both heavy-bodied. The first is poisonous, the second is not.

19. *Can you tell a poisonous snake by the shape of the pupil of its eye?*

In the Northeastern States you can. In this area, snakes with round pupils are harmless, and snakes with vertically elliptical pupils like this () are poisonous. But this rule applies only to the snakes of certain comparatively small parts of the world and it does not hold true generally.

20. *Do all snakes of the same kind have the same kind of color and markings?*

Far from it. Snakes show a great variety in color and pattern among the same species. The Common Garter Snake, for instance, usually has stripes of some shade of yellow, but the stripes may be greenish, bluish or brownish instead. And the main body color of the snake may be black, dark brown or ranging from greenish-olive to light olive.

21. *Can you tell the age of a rattlesnake by the number of its rattles?*

No. Rattlesnakes usually get a new segment on their rattles at each shedding, which may occur from two to four times a year. Or they may wear off or break off one or more segments.

22. *Will a poisonous snake die if it bites itself?*

That depends. If it bites itself in a vital organ, such as the heart or lungs, it is likely to die from the mechanical injury inflicted by its fangs. But its own poison, injected into some non-vital spot, seems to cause no ill effects.

23. *Will a Rattlesnake refuse to crawl over a horsehair rope?*

No. It doesn't mind in the least. This has been demonstrated many times.

24. *Do Prairie Rattlesnakes live peacefully in holes used by Prairie Dogs and Burrowing Owls?*

Probably they live peacefully enough as far as *they* — the snakes — are concerned. Prairie Rattlesnakes eat Prairie Dogs and Burrowing Owls.

25. *When a Rattlesnake strikes, does it jump at you?*

No. Generally speaking, it strikes with the forward third of its body. Sometimes the force of its strike may cause the rest of the body to slide forward a little.

26. *Does a Rattlesnake always "rattle" before it strikes?*

Not always, by any means.

27. *Is there really a "Glass Snake?"*

There is a creature *called* a Glass Snake, but it isn't really a snake — it is a legless lizard. Its long tail breaks rather easily, but the tail does not rejoin the body. The lizard eventually grows a new, but stumpier, tail.

28. *Do snakes have ears?*

They don't have the same kind of auditory organs as human beings, but they are able to sense vibrations through their bodies.

29. *Can a snake "charm" its prey?*

No. Occasionally a small bird or animal might be too frightened to get out of the way of an attacking snake, but this isn't an exhibition of "charming." There is nothing occult about it. Usually, as a matter of fact, such prey seems indifferent to the presence of the snake.

30. *Will any snake deliberately attack you?*

This is a debatable point. A good many naturalists hold that no snake is deliberately aggressive and that what appears to be an out-and-out attack is really the result of some movement on the part of the human being, which the snake presumably interprets as aggressiveness on the person's part, whereupon it defends itself by attack. In about 99 cases out of 100, snakes will turn tail and try to get away, however, rather than put up a fight. Usually they attack only if they are cornered or can't get away.

31. *Do any snakes have legs?*

Although this is in the realm of "Believe It or Not," some snakes do have the rudimentary remnants of legs. Pythons and boas are examples. These left-over legs from millions of years ago are simply two short spurs that project from either side of the body in the region of the vent. All snakes are descended from reptile-like creatures with legs.

32. *What makes snakes smell so bad when they are picked up and handled?*

The odor comes from scent glands at the base of the tail. One of its functions may be to make the snake unpalatable to enemies; it is also believed to function during snake courtship.

33. *Do Copperheads smell like cucumbers?*

That depends on the person doing the smelling. Some think they do, some think they don't.

34. *Can a snake charmer really "charm" a snake.*

It depends on what is meant by "charming." If something like mental control is implied, with the "charmer" hypnotizing the snake, the answer is definitely "No." So-called snake charmers who squat in front of a Cobra and play a flute, while the snake sways back and forth, are not exercising any mental control over the snakes. The Cobras are merely swaying in rhythm with the movements of the flute or the "charmer's" body.

35. *How can a snake manage to swallow prey apparently larger than its own head?*

A snake's jaws are not on a fixed hinge, like ours, but are connected by ligaments that stretch. These enable a snake's upper and lower jaws to separate to admit large prey. Once the food is inside the snake's body, the overlapping scales give the body plenty of stretching room also.

36. *Are snakes slimy?*

Snakes are dry and clean, unless they happen to have been swimming or crawling over a wet surface. They certainly are not slimy.

37. *Are snakes dirty?*

In the sense that a pig might be dirty, no. A normal snake is dry, clean and probably no more subject to disease than any other creature. Snakes have an assortment of internal and external parasites, but probably not as many as the family dog or cat.

38. *Are all green snakes poisonous?*

No. The common Green Snakes of the United States (the Smooth Green and the Keeled Green Snakes are familiar residents of this area) are not only among the handsomest of American snakes, but are perfectly harmless. Indeed, they can rarely be induced to bite.

39. *How do snakes kill their prey?*

There are three ways — by injecting poison, by constricting (squeezing to death) and by swallowing the prey while it is still alive.

40. *Is the Blacksnake an enemy of the Rattlesnake?*

No. Blacksnakes and Rattlesnakes often spend the winter in the same dens, or sun themselves on the same ledges.

41. *Can a King Snake kill a Rattlesnake?*

Yes. It probably prefers a diet of lizards and rats and mice (for the King Snake is one of the best friends a farmer could have to keep down rodents), but it can, and does, kill Rattlesnakes, Copperheads and Cottonmouth Moccasins. It has a high degree of immunity to their venom.

42. *How does a King Snake kill a Rattlesnake?*

Simply by constriction. It throws its coils around the Rattlesnake and begins to swallow it, usually head-first, as soon as the Rattlesnake is helpless.

43. *Can a Rattlesnake kill a King Snake?*

Yes, if its fangs pierce a vital organ in the King Snake — the heart, for instance. The venom of the poisonous snake seems to have little or no effect on the King Snake.

44. *Do other animals kill and eat snakes?*

Many of them do — hogs and turkeys, to name only two. The Mongoose, of India, is probably the best-known example of a snake-killer, because of Kipling's story of Rikki-Tikki-Tavi.

45. *Are any animals immune to Rattlesnake poison?*

The Skunk is partially immune. Hogs are often thought to be immune, but they only seem to be, because the poison is usually injected into a layer of fat which absorbs the venom slowly, thus giving the body time to cope with it. If bitten in the right place, a hog can be killed by a Rattlesnake as easily as any other animal.

46. *Is there such a thing as a Flying Snake, and can it fly?*

There is a Flying Snake, so called, in the Malay Peninsula. It doesn't fly like a bird, of course, but it can coast from a high branch to a low one by flattening its body.

47. *How are the young of snakes produced?*

All snakes come from eggs. Some species deposit the eggs in the earth, in rotting logs, in leaf mold, and so on, and they hatch in due time. In other species, the eggs are retained in the female's body until they are just on the point of hatching, whereupon the young are produced alive.

48. *Do snakes show any "mother love" for their offspring?*

No. Snakes hatched from eggs that have been deposited and allowed to incubate very likely never see either of their parents, and even snakes that are born alive begin to wander off very soon after birth. The young of poisonous snakes are born or hatched with poison fangs and a supply of venom. They are well able to take care of themselves immediately and the mother and father pay no attention to them. The young of non-poisonous snakes are capable immediately of foraging for worms, bugs, and the like.

49. *Do snakes swallow their young in time of danger?*

Thousands of persons write to naturalists every year and say they have seen snakes swallowing their young, but no naturalist has even seen it. There are many possible explanations of what the witnesses of the event actually did see. After many years of combating this myth, most naturalists are content to point out simply that snakes have no special pouch or organ to accommodate their brood after birth, and that if young snakes were swallowed they would either be suffocated or digested.

50. *Is it natural for man to be afraid of snakes?*

Generally speaking, no. Babies and children who have never been told they ought to be afraid of snakes do not, as a rule, show any fear of them — may even think snakes are pretty toys. Many persons assert they were never warned against snakes, and yet have an "instinctive" fear and dread and horror of them. This would be pretty conclusive evidence that man *may* have a natural fear of snakes, but first it would have to be proved conclusively that such persons actually were never told "snake stories" or warned against snakes.

It's Nesting Time Again

And the Zoological Park's Birds Are Responding to the Springtime Urge—Ducks Have Even Nested on the Lion Island

WILLIAM BRIDGES

There is a famous story about a friend of Henry Thoreau's who asked him one day, while they were walking in the fields, where Indian arrowheads might be found.

"Everywhere," said Thoreau. And he reached down and picked up an arrowhead at his feet.

I thought about that story last month when a newspaper reporter called on the Curator of Birds to get a story about "signs of spring." Sitting in Curator Crandall's office, the talk turned to the nesting of birds and particularly the wild ducks that have become established in the Zoological Park. Mr. Crandall remarked that they nested pretty nearly anywhere and everywhere around the Zoo.

"But just where, specifically?" the reporter insisted. "I walked through a lot of the Zoo on my way to your office, and I didn't see any nesting."

"Well," said Crandall, "they might nest . . ." His eyes focussed out of the window while he undertook to think of specific nesting sites.

"Well, for instance, one's nesting right over there!" he exclaimed. "Here — look out of the window and you'll see a Mallard pitching down into that clump of bushes right now!"

And she *was* nesting there, too; sheltered by vines and brambles, a Mallard was incubating a full clutch of eggs in a hillside nest only a few yards from the Zoo's Concourse parking circle.

When the reporter actually saw the nest, and the duck sitting on it, his surprised exclamations made it abundantly clear that the Curator of Birds had proved his point — that ducks were likely to be nesting almost anywhere.

* * *

Of all the foolish places that ducks have picked as nesting sites in the Zoological Park in the past forty years, the most ill-advised would certainly seem to be the rim of the Lion Island in the African Plains exhibit.

In the first place, the lions patrol almost every inch of their island, with the exception of a couple of square yards on the southeast rim where barberry bushes maintain a precarious hold on the soil. And in the second place, only the south moat contains water, and this to a depth of only a few inches.

Any ducklings hatched on the island, therefore, must tumble out of the nest directly into the water many feet below, and must stay there until their wings develop sufficiently for them to fly out of the moat in the autumn.

Despite all these handicaps – which to anyone but a duck might seem almost insuperable – a hardy Mallard started to nest in the shelter of the barberry bushes this spring.

Three eggs were laid on successive days in a shallow depression some 18 feet above water and perhaps 10 feet above a narrow shelf of rock. The Curator of Birds was not alarmed about the fate of the ducklings; he was certain that they would climb out of the nest, fall down to the shelf, bounce off and tumble unharmed into the water. His reasoning, however, was based on a faulty premise. He took it for granted that the duck would continue to lay, that the eggs would hatch. But after three days, the duck disappeared. Perhaps a prowling lion disturbed her on the nest, perhaps she fell prey to the ills that ducks are heir to, or perhaps she just changed her mind. Anyway, she went away and did not return.

That seemed to be the end of that episode, until about a week later when Keeper Crowley happened to glance down into the south moat – and saw a pair of Mallards and eleven ducklings serenely swimming!

Where they came from, nobody knows. The keeper of the Lion Island swears that he has examined every part of the island, and there just *isn't* any place for a duck's nest except under the barberry bushes. Yet somehow, and somewhere, a Mallard managed to find a nesting site, to incubate her eggs for four weeks, and to bring her ducklings safely to water without being sighted by the keen eyes of lions and keeper. It's a mystery.

* * *

As proof that newly-hatched ducklings are able to survive a fall of fifteen feet or more, the Curator of Birds cites the example of Wood Ducks.

These handsomest of North American ducks are tree-nesters. Holes in hollow trees, or high stumps, are their invariable nesting places in the wild and the young birds may come into the world to discover that they are twenty or more feet above the ground or the water.

"There has been a controversy for many years about how Wood Ducks get down from their nests," Mr. Crandall said. "There have been all sorts of stories – some say the mother picks the babies up in her beak and carries them down, or that she takes them in her feet, or between her thighs, or that they ride down on her back. You can find plenty of people who say they've seen those things happen, but most ornithologists were pretty sceptical.

"Well, back in 1938 Alfred Ezra, the great British aviculturist, gave a garden party for the British Avicultural Society and I happened to be in England at the time and attended. Walking around the grounds with Ezra's head keeper, I saw a nesting box of some kind about twenty feet up in an oak tree, and I asked him about it.

"He said he had a nesting Wood Duck in the box, so I brought up that matter of the babies getting down from the nest.

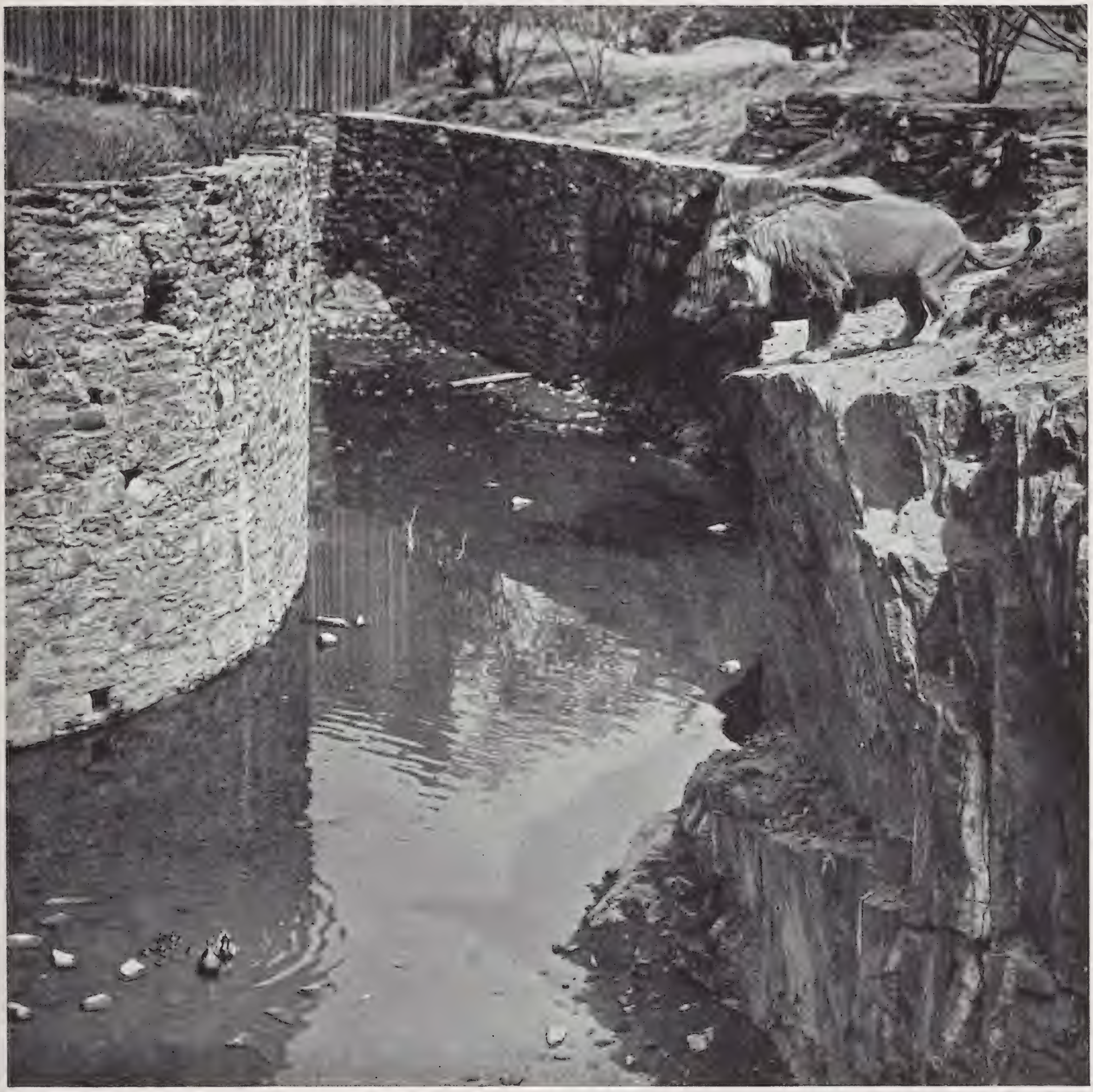
"There wasn't any mystery about it to Ezra's head keeper, and no hocus-pocus about riding down on the mother's back.

" 'You see that big limb that leads out from the front of the nest?' he said to me. 'After the brood's all off, the hen goes out on the limb and begins calling. One after another, the ducklings come out of the nest and start out on the limb. They can't hold on, and they fall to the ground. They huddle up together as they fall, and after the whole brood has fallen, the hen flies down and leads them off to water. I've seen it happen any number of times over the last twenty years.' "

And the testimony of Ezra's head keeper, said Mr. Crandall, was sufficient to settle the controversy as far as he was concerned.

* * *

Oddly enough, although half a dozen broods of Wood Ducks are hatched in the Zoological Park every year, no one has ever found one of their nests. Wood Ducks are extremely shy and secretive birds while they are nesting – in contrast to Mallards, which are just as likely to start nesting on the lawn in front of the Zoo's Administration Building as anywhere else – and they keep themselves well hidden during the critical spring period when the foliage is light. Their secrecy and caution are valuable assets, for they generally manage to rear their broods with few losses – again in contrast to the Mallards and Black ducks, which are many times more numerous and start many more broods throughout



A Lion looks at Ducks—probably with as much wonder and amazement as the Lion's keeper also looked at the ducks. For these Mallards and their brood were hatched somewhere on Lion Island, in a nest so well concealed that no one knew it existed. In the shallow water of this moat the ducklings will stay until they can fly next fall.

the Zoo. Mallard and Black ducklings easily fall prey to snapping turtles and marauding boys in and around the Bronx River, but such a fate almost never falls to a Wood Duck family. Despite this, Wood Ducks remain comparatively rare, just as they have been since the very earliest days of the Zoological Park.

Thanks to the destructive ice storm of two years ago, damaged trees are commoner in the Zoological Park than they used to be, and thus there are more opportunities for Wood Ducks to find nesting places. Fifteen or twenty years ago, when the foresters kept themselves busy the year round patching damaged trees, Wood Ducks were hard put to it every spring to find homes and once or twice each season the Bird House staff was sure to get an emergency call from the Administration Building to come over and rescue a Wood Duck that had mistaken the chimney for a hollow tree, and had ended up in the cold fireplace in the Members' Lounge. Two years ago, while an unused room on the second floor of the building was being cleared out, the dried carcass of a Wood Duck was found in the fireplace.

On rare occasions even a Mallard or a Black duck will take to trees or bushes as a location for its nest. One of the Zoo's maintenance men this spring discovered a Mallard nesting in a tree in the thickest part of the Park's woods, about twelve feet from the ground. Without the Wood Duck's racial instinct to guide her, it will be interesting to see how she manages to get her brood to the ground. The Curator of Birds is betting that they fall out of the nest, as any other ducks would have to do.

* * *

Nesting time is a time of anxiety not only for the feathered inmates of the Zoological Park but, to a considerable degree, to the Bird House staff. They have had two particularly troublesome problems on their hands this spring.

In the first place, a pair of ravens in the roomy cage just south of the Aquatic Bird House showed unmistakable signs of wanting to nest. It would be nice to have a brood of young ravens, and Head Keeper Scott determined to further their ambition. He ordered a great quantity of first-class nesting material — sticks and twigs — deposited in the cage.

All went well at first. The female, an European Raven, worked industriously at the pile of twigs and in a few days had carried a peck or so of them into the forks of a perching tree in the center of the cage. The male, an American Raven, was only able to give assistance on the ground, however. Before he came into the collection the bird's wing had been slightly injured, and he has never been able to fly with ease. Burdened with twigs, it was impossible for him to reach the site of the nest.

Since Ravens cooperate in nest-building, Scott thought he could help things along by setting a plank in the nesting tree in such a fashion that the male could hop up to the nest.

The Ravens stopped nest-building the same day. Apparently the plank, being new and strange, so disturbed them that they lost the nest-building drive.

The plank came out immediately, but the Ravens were through for the season. Their energies subsequently went into a daily scolding match with a peacock who chose that particular part of the Zoo to strut and scream. Every time he came too close to the Ravens' cage, the male Raven pounced on the tips of his feathers as they brushed the wire, and tried to drag them out of the peacock's train.

The staff's other major problem was the nesting of the Long-tailed Birds of Paradise.

Early in the spring of last year the female Long-tail was found to be egg-bound, and after some difficulty her condition was relieved and the egg was recovered. It was the first time an egg of this particular Bird of Paradise had ever been identified, and Mr. Crandall seized the opportunity to have an accurate drawing made, and it was reproduced in color and described in the pages of the Society's technical journal, ZOOLOGICA.

An attempt was made to incubate the egg, but although it was determined to be fertile, it failed to hatch. Presumably incubation requires special conditions of temperature and moisture, and in default of any accurate information about such requirements, the incubator could be regulated only by guesswork.

The Birds of Paradise made no attempt at nest-building last year, even with such casual bits of nesting material as were in their compartment. This winter Mr. Crandall was prepared for them. He stocked the cage with raffia and twigs, and even went so far as to weave a rough, basic nest out of willow withes and set it in the branches of the birds' perching tree.

The Birds of Paradise seemed to appreciate his attentions. Both male and female worked industriously on the nest for several weeks. They wove raffia into the willows and spent long daylight hours tugging and pulling.

But they haven't produced an egg.

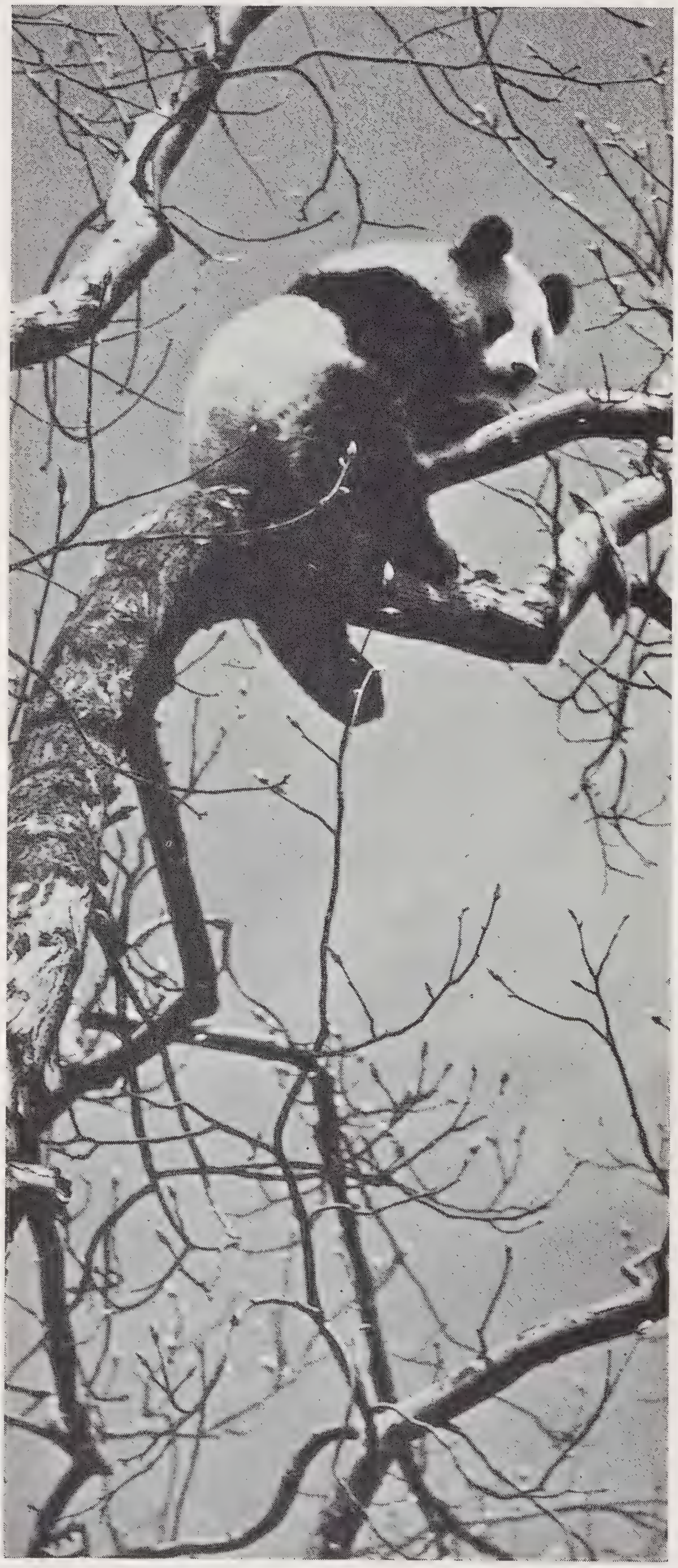
BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

PANDA UP A TREE

Possibly to demonstrate his zoological relationship to the raccoons, our male Giant Panda climbed a hickory tree in the Panda Enclosure on April 21 and refused to come down until forty-one hours later. During all that time he was without food and water, but apparently minded it not at all.

Although the tree was sheathed in galvanized iron to prevent just such an exploit, the Panda managed to climb above the sheathing by means of a cedar log lying in the enclosure. Keepers tried to climb above him, and offered bamboo, but to no avail. Eventually the female Giant Panda was turned into the enclosure, and was given a pan of cornmeal mush; the male heard the rattle of the pan and came down of his own accord.



In their native China, Giant Pandas are supposed to spend a good deal of time in trees. Obviously they are easily at home far above the ground. That was the Zoo staff's only consolation as it watched the animal straddling limbs 40 feet up.

WE HAVE A BABY PENGUIN

Too late to include in the article on nesting time in the Zoo, word comes that the first of two Black-footed Penguin eggs has hatched in the "Penguinarium" in front of the Reptile House.

The egg was laid on Easter Sunday, April 5, and its incubation proceeded exactly on schedule, for Penguins require thirty-eight days to hatch and on the morning of Tuesday, May 12, the actions of the nesting bird revealed that the baby had arrived. From brief glimpses of it, the bird is almost naked, covered with a faint gray fuzz. It is not likely to be seen out in the open before at least three weeks — probably during the second week in June.

This is the first Penguin that has been hatched in the Zoological Park since 1915.

* * *

The Alaskan Indian totem pole and chief's house, landmarks in the Zoological Park since 1904, were taken down in April and presented to the Museum of the American Indian—Heye Foundation for re-erection at the Museum Annex at Eastern Boulevard and Middletown Road. The pole and house were brought back from Alaska by the Harriman Alaska Expedition in 1899, having been found abandoned at Cape Fox in a village where Tlinket Indians had formerly lived. The house had been used for grain storage in recent years and both house and pole seemed of greater value in connection with the Museum's specialized American Indian exhibit.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Patron

Mrs. Milton Erlanger

Life

Miss Frieda Hempel

Annual

Miss Evelyn Bartram
Mrs. M. M. Dorland
Jack A. Saul

Junior Members

Wyman Carroll, 3rd
Robert Crane
Hilliard Firshein
Sydell Goldberg
Stanley Levine
Angelo Medici
Jerome Schulman
Allan Seidner
Leon Sunfist

PUBLICATIONS OF INTEREST

BOOK OF BAYS. By William Beebe. 302 pp., 34 illus. Harcourt, Brace & Co. $3.50.

Last fall Dr. Beebe wrote a fascinating article for the *Bulletin*. "A Chapter of Accidents and Exceptions" it was called and it recounted the little adventures of a single day while the *Zaca* was cruising from Cape San Lucas to Banderas Bay on the west coast of Mexico.

The adventures were, indeed, little adventures – a sparrow, an owl and a moth came aboard the yacht, a dolfin was caught and a dolphin observed, in one way or another a booby, phalaropes, marine insects and a sea-snake came into the ken of the scientists. None of them amounted to anything as precise, statistical facts to be fitted into the various 'ologies represented on the expedition, but to Dr. Beebe they suddenly took on new interest because of his realization that they were bound together by their relationship to the land.

And so, on that theme, he wrote an absorbing account of the day's adventures. Small happenings, commonplace events – but insignificant parts that made up a significant whole.

That article in the *Bulletin* has been expanded into one of the twenty-three chapters in "Book of Bays" – the bays being the series of indentations along three thousand miles of Pacific coast from Mexico to Colombia along which Templeton Crocker's yacht *Zaca* cruised on the thirty-eighth expedition of our Department of Tropical Research. One or two other *Bulletin* articles have been included in the book.

As the members of the Zoological Society should know by now, Dr. Beebe is an economical man; nothing goes to waste on his expeditions. When he starts after specimens and data, all of his sense are working full time, and he is storing up impressions of sights and sounds, touch, taste and even the odors of the off-shore breezes. These he has contributed to the chapters of "Book of Bays." Dr. Beebe says the book is "froth," and the "technical meat" of his expedition is served up in scientific courses elsewhere. It is mighty satisfying, mighty exciting froth.

ALL ABOUT ELEPHANTS. By Dorothy Lee Edwards. E. P. Dutton & Co. $1.50.

This is a little book with an ambitious title. To tell all about elephants would require many more pages than its covers contain. Nevertheless, it gives a lot of reliable and interesting information about the world's largest land mammal. Intended for boy and girl consumption, it will be found readable and worth-while.

At the Bronx Zoo during the course of a year we are asked many questions concerning elephants. What do they eat? How much do they weigh? How long do they live? Just the other day a telephoned request was concerned with the number of toes on an elephant's hind foot. This book would have supplied the answer.

Miss Edwards gives a short history of elephants in America and tells how the birth of a baby elephant was such a great event that it led to the formation of the famous circus combination of Barnum & Bailey. Other chapters tell of the life of elephants in the wild, how they are captured and put to such prosaic tasks as carrying logs, and, what is more exciting, how they are used in war and hunting the tiger.

A first chapter discusses the extinct ancestors of our modern elephants known to us only through their fossil remains and drawings left by prehistoric man. – *Claude W. Leister.*

BOOK BARGAINS

Publications of the New York Zoological Society
Offered at Savings of 50¢ to $1.50

THE AMERICAN BISON — By Martin S. Garretson

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for the first accounts of its appearance and habits, pictures its wide range and incredible numbers. It sets forth authentically the natural history of the animal, describes the tragic course of extermination that ranged unchecked until there were only 1,091 bison left in the whole of North America, and then it tells of the rise and development of a strong national sentiment that saved the species from extinction. *254 pages, 65 illustrations.*

Was $2.50 . . . . . Now $1.50

PETS AND HOW TO CARE FOR THEM — By Lee S. Crandall

As Curator of Birds in the New York Zoological Park, Mr. Crandall has responsibility for the diet, health, cage conditions and general well-being of some 2,000 birds of many species. Out of his experience with the Zoological Park's collection and a life-long enthusiasm for pets of every kind, he has written a completely authoritative and practical book on pets and their maintenance in good health. He devotes individual chapters to Dogs, Cats, Domestic Rabbits, Small Wild Animals, the General Care of Birds; Pheasants, Peafowl and Guineafowl and Quail, Waterfowl, Parrots, Cage Birds, Canaries, Domestic Pigeons, the General Care of Fishes and Aquarium Fishes. *296 pages, 96 illustrations.*

Was $2.00 . . . . . Now $1.00

PRESENT DAY MAMMALS — By Claude W. Leister

Students in Zoology and Biology classes and the general reader who has often been puzzled by the relationship of animal groups will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. It answers such questions about mammals as: What does it look like? How big is it? To what is it related, and why? Whence does it come? Typical representatives of every Order of mammals are pictured here, accompanied by a clear text explaining the zoological status of the animals. *74 pages, 106 illustrations.*

Was $1.00 . . . . . Now 50 cents

Order from:
Department B, Zoological Park, Bronx Park, New York City
(Make checks payable to New York Zoological Society)

NEW YORK ZOOLOGICAL SOCIETY

XLV • No. 4 JULY–AUGUST 194

.673
59

ANIMAL KINGDOM

BULLETIN, PUBLISHED BY THE
NEW YORK ZOOLOGICAL SOCIETY

DITMARS: IN MEMORIAM, *by Fairfield Osborn* • OUR CHANGING FAUNA, *by Pa*
wold Howes • MORE FACTS ABOUT SNAKES, *by Robert Mathewson* • PARK HAPPENIN

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

ASST. TREASURER
City Bank Farmers Trust Company

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
George C. Clark
C. Suydam Cutting
Alfred Ely
Marshall Field
De Forest Grant
David H. McAlpin
Robert Moses
Fairfield Osborn

BOARD OF TRUSTEES

Class of 1943

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert I. Gannon
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

William Bridges	*Editor & Curator, Publications*
Jean Delacour	*Technical Adviser*
C. J. McGahey	*Comptroller*
Harry Sweeny, Jr.	*Supt., Construction & Operation*
John Tee-Van	*Executive Secretary*

ZOOLOGICAL PARK

W. Reid Blair	*Director Emeritus*
William Beebe	*Honorary Curator, Birds*
Lee S. Crandall	*Curator, Birds*
Leonard J. Goss	*Veterinarian*
Claude W. Leister	*Curator, Mammals*
Harry C. Raven	*Associate in Anatomy*

AQUARIUM STAFF AT ZOOLOGICAL PARK

Charles H. Townsend	*Director Emeritus*
Charles M. Breder, Jr.	*Director*
Christopher W. Coates	*Aquarist*
Ross F. Nigrelli	*Pathologist*
George M. Smith	*Research Associate in Pathology*
Homer W. Smith	*Research Associate in Physiology*
Myron Gordon	*Research Associate in Genetics*

DEPARTMENT OF TROPICAL RESEARCH
William Beebe, *Director*

Jocelyn Crane	*Research Zoologist*
Henry Fleming	*Entomologist*
George Swanson	*Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE
NEW YORK ZOOLOGICAL SOCIETY

VOL. XLV AUGUST 4, 1942 No. 4

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York, N. Y.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

On the Farm

Circumstances conspiring together, so to speak, frequently produce a novel idea. The "Farm-In-The-Zoo," which has been most enthusiastically welcomed by the public since its opening on July 11, was the result of such a conspiracy. Of course the basic circumstance was the fact that the majority of people in America had left the farm and moved into the cities. We became dimly aware that a large part of our public had neither seen a farm animal — in the raw — nor had any conception of farm life. This did not seem quite right to us. The next circumstance was the construction of some new buildings of the farm type which were intended to replace our old service buildings, doomed because of the projected Bronx River Parkway extension. This group of buildings, constructed from designs prepared by the Department of Parks, have turned out to be service buildings *plus* and it soon became apparent that they were extensive enough not only to answer the Park's service purposes but also to provide excellent quarters for an exhibit of domestic animals.

Thus the scene was laid and the first completely stocked farm in any zoological park has now come into existence.

All the animals are there — cattle, horses, swine, sheep, poultry. The story of milk is there, and how poultry is raised. For many a city dweller it will be the first glimpse of country life — and what the country means to us city people. Thus it becomes more than a passing show. It may well be a means of bridging a gap which should never exist.

Fairfield Osborn

THE COVER

Cruising offshore in a tipsy boat, Staff Photographer Fitz somehow managed to get a remarkable series of photographs of gibbons and spider monkeys at play on the Zoological Park's Monkey Island. Evidently there are several adventurous and inquisitive spider monkeys in the little colony, for one or two of them were fascinated by the water and delighted in hanging from low branches to dip their fingers in the strange element. The picture on the cover of ANIMAL KINGDOM *shows one of the boldest of the spider monkeys, on an exploring trip.*

●

AUTHOR

Paul Griswold Howes, whose notes on the changing fauna of nearby Connecticut will be found in STRANGERS IN OUR MIDST, *will be remembered by older members of the Zoological Society as author of the insect section of one of the most valuable and entertaining publications the Society has ever issued* —TROPICAL WILD LIFE IN BRITISH GUIANA, *by Dr. William Beebe, Mr. G. Inness Hartley and Mr. Howes.*

●

ADDRESSES

Members of the Society and subscribers to ANIMAL KINGDOM *should notify us promptly of changes of address this fall.*

IN THIS ISSUE

Inquisitive Spider Monkey . . . . *William Fitz, Jr.* COVER
Raymond L. Ditmars . . . . *Fairfield Osborn* 83
Strangers in Our Midst . . . . *Paul Griswold Howes* 85
An Octopus On Guard . . . . *Charles M. Breder, Jr.* 91
Questions Everybody Asks About Snakes. II. . . . . *Robert Mathewson* 95
Birds Astray . . . . *William Bridges* 99
Behind the Scenes: News and Notes 102

Aug [illegible] 1942

RAYMOND LEE DITMARS

1876 - 1942

July 17, 1899

Assistant Curator of Reptiles

1902

Curator of Reptiles

1926

Curator of Mammals and Reptiles

1940

Curator of Reptiles and Insects
Honorary Curator of Mammals

Raymond L. Ditmars

Aspects of An Extraordinary Career

FAIRFIELD OSBORN

In July of 1899, Raymond L. Ditmars, twenty-three years of age, came to the Zoological Park as Assistant Curator of Reptiles. The circumstances surrounding his appointment were highly unusual. Several weeks previously, as a young reporter from the New York *Times,* he had called on Dr. Hornaday, Director of the Park, to obtain material for a news article. Dr. Hornaday, gruff and vigorous in his dealings with other people, no doubt met the cub reporter with some impatience. To his surprise, however, young Ditmars not only seemed to know something about reptiles but conveyed his own conviction that snakes were nature's choicest handiwork and that the herpetologist was blessed above all other men. His appointment, which followed soon after this meeting, was a credit to the discernment of the officials of the Society and marked the commencement of a career which will have a lasting place in the annals of popular zoology.

A full biography is in certain respects easier to write than an article such as this which can do no more than point to some of the highlights of a life marked, in this instance, by varied and unusual accomplishments. I shall also attempt, although with considerable hesitancy, to indicate the principal reasons for the extraordinary reputation Dr. Ditmars acquired as a naturalist, and especially as "the man who knows all about snakes."

In the first place, the enthusiasm for animal life in general and for reptiles in particular which so impressed Dr. Hornaday at that first interview, remained undiminished and unquenchable to the very last moment of Dr. Ditmars' life. I recall his showing to me as recently as February of this year a new scheme he had evolved for the exhibition of the parasol ant colony in the Reptile House. As he described the plan, incidental as it was, his voice and manner conveyed an enthusiasm which might only have been expected in a youth who had the making of his career still ahead of him.

Another outstanding characteristic was his readiness to give everything he had, so to speak, to those who came to him for information. It seemed to matter not at all to him whether the inquirer were child or adult, ignorant or informed; his task – or pleasure, rather – was to impart every scrap of information that he himself possessed. His patience and energy were amazing, not only in personal interviews but in connection with his general correspondence, which became more and more voluminous as the years progressed.

The establishment of his reputation came with the publication in 1907 of "The Reptile Book" – the title later being revised to "Reptiles of North America." In the preface of this volume he writes: "In the present work the writer has sought to compile a popular review of a great fauna – the Reptiles of North America. He has excluded technical phraseology and tried to produce two results: 1. A popular book, that may be comprehended by the beginner, and, 2. A book valuable in its details to the technical worker. Though some scientists scoff at all language except that which is obscure to everybody but themselves, I feel sure that to even that Few, this book will be of interest, for the illustrations alone tell the story." And elsewhere, he states:

AUG 7 1942

"But one condition can bring about more general knowledge and interest in the great Class of Reptiles and that is the special treatment of structure and habits in a manner sympathetic to the needs of the Many, who crave to learn." In all he produced seventeen books, many of which, such as "Thrills of a Naturalist's Quest," were by intention of popular and anecdotal nature.

The quotation from the preface of "The Reptile Book" proved in effect to be the key and theme of his life. He was mindful of the curiosity for knowledge of the "Many," as he called them, feeling no doubt that the pure scientists could take care of themselves. As the years passed, his methods and areas for interpretation broadened. He became widely known as a lecturer who appealed to every type of audience. He prepared his lectures with great thoroughness and used imagination in his methods of presentation. He was one of the earliest pioneers in the use of motion pictures and with arduous preparation he so synchronized pictorial matter with the spoken word that his lectures were perfected expressions of information and artistry. Fortified by an unusually retentive memory, he drew with facility upon a reservoir of information and observation.

There is little need to comment here upon his detailed accomplishments as Curator of Reptiles in the Zoological Park and later also as Curator of Mammals. He had a good working knowledge of mammalian life but his first and most absorbing interest was in reptilian forms. He went almost every year to tropical America and invariably returned with some striking and interesting specimens of reptilian and insect life. His experiments in extracting venoms from snakes, together with the facility which he soon acquired in this dangerous pursuit, surrounded him with an aura which appealed to the public. Pioneer workers in the medical world could always count upon him to supply numerous types of venoms from the varied and rare specimens of poisonous snakes in the collections in the Zoological Park.

There was about him some quality which lent itself to the dramatization of his work. The representatives of the press publicized the least of his doings because they, like everyone else who knew him, were fascinated by the intensity of his interest in his field of work. Reporters in search for material always knew they would get a good story from Dr. Ditmars. What they did not know was that so would every child or adult who came to him or wrote to him for information. If, in a certain sense, his career was fulfilled at all times during his life, certainly it was at the time of his death. The pattern and motives of his life were consistent from beginning to end. He was the champion of the most lowly, least liked, least understood forms of animal life. He reawakened in people their innate interest in all manner of living things but beyond this he accomplished a near-miracle, for it was he who did so much to create in the public mind here and abroad an understanding of reptiles and their place in the scheme of nature. This was his intention and this is what he accomplished.

Strangers in Our Midst

Quietly and Unobtrusively, a Surprising Number of Forms of Animal Life Have Been Extending Their Ranges into Connecticut

PAUL GRISWOLD HOWES

Curator of The Bruce Museum, Bruce Park, Greenwich, Connecticut

IT WAS MORE than thirty years ago that my first observations on the fauna of Connecticut were published, and nearly forty years have passed since my initial collections of specimens found themselves arranged in some sort of order in the rough cases of my first little home museum. During all these years, except for certain periods spent in the tropics, I have had my eyes and ears to the ground in my own particular environment, watching ever so closely for signs of change in our rich and interesting fauna.

I feel that I am at least normally observant after so many years in the field. I go often, and stay long hours once away. Ninety to a hundred field trips during a single spring and summer are not an unusual record for me, but in all these field hours, during all these years, my observations have only served to emphasize how very rarely any faunal change may be expected.

Most of the changes which are observed today, are as one would expect in such a destructive human world, in the nature of diminution, or the threatened total loss of a species. Again there are those disturbing changes wherein we acquire sanguine pests and enemies, yet for all of these ill omens in the world of wild life, there are occasional signs of change which are interesting and even encouraging.

Certain forms have learned to live with civilization, like the white-tailed deer or the city gray squirrels, and there are other similar cases which might be mentioned, but the purpose of this article is not to point out these old time natives which have withstood civilization's advance, but to record and illustrate the few interesting newcomers which have added themselves to the Connecticut fauna and which we now find actually increasing in our midst, and to mention other interesting possibilities.

All photographs by the author.

The most definite and conspicuous of these newcomers among the higher animals, is the common or Virginia opossum, *Didelphis virginiana.*

Authoritative books published as late as 1928 gave the normal range of this marsupial as the Hudson Valley to northern Texas and almost to the Gulf Coast, and west to the Great Lakes.

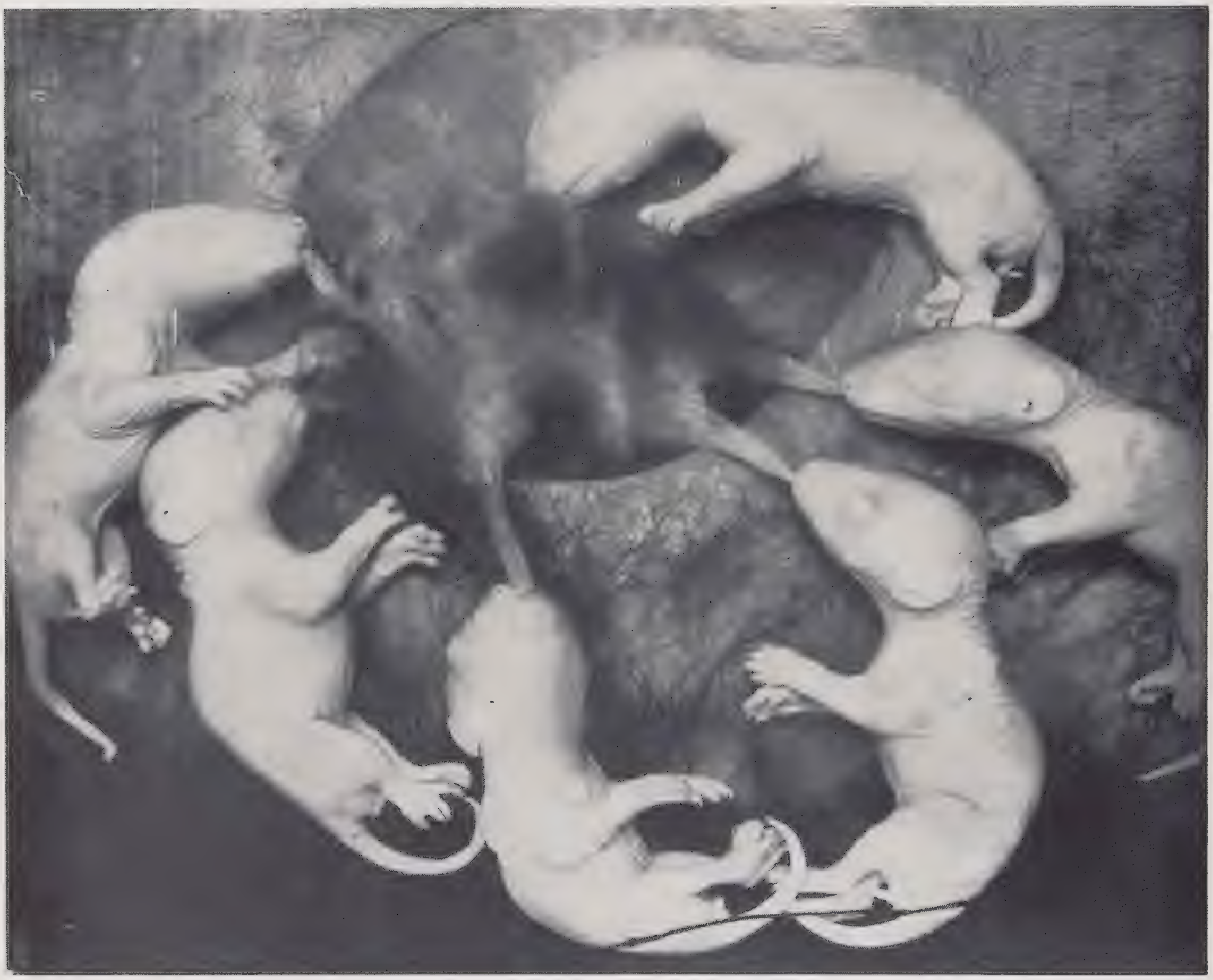
Prior to 1924 I had never found an opossum in all my northern rambles, but during that summer, one came to live among the rocks of a railroad cut a few hundred feet from the museum.

This individual was seen almost daily throughout the summer. It came about the chicken coops belonging to the superintendent, but not once did it molest the young chickens nor did any eggs ever disappear. It ate up the apples and pears which lay upon the ground nearby, and later climbed into the branches to secure additional fruit, and then toward the fall it disappeared and was not seen again.

Each year after 1924, I saw one or two opossums. In 1932 they became more numerous. One lived in an apple tree near the back door of my house and raided the garbage can nightly. Others were killed by cars on the roads nearby, and people brought several to me at the museum as great curiosities.

Now in 1942, the opossum is not at all uncommon here in southern Connecticut; it appears to be increasing, and litters of young rescued from badly injured mothers in 1938 (June 27th) and 1941, grew strong and healthy at the museum upon a diet of bread and milk and bananas with a few table scraps thrown in.

Young opossums are born in a very undeveloped condition. They are still in the embryonic stage, actually, and soon after birth they crawl into the abdominal pouch of the mother. Here each youngster seeks out a teat, to which it becomes attached, and so it remains for some time before emerging again.



These six very young Virginia opossums have been removed from the mother's pouch to show their undeveloped state at birth. Each baby is firmly attached to a teat and it is almost impossible to detach it. Large families of ten or more are the general rule among opossums – one of the reasons why the opossum has increased its range.

Let us look again into the subject of faunal change.

On June 8, 1925, I was searching that prolific naturalist's country back of Lewisboro, New York, not far from the town of New Canaan, Connecticut.

Lewisboro had once been a community of little farms, from whose rough and rocky hillsides their owners must have striven desperately to eke out a living. Inevitably they failed, so the land was abandoned to weeds and thickets and the strong young timber which grows so easily where crops succumb.

On the silvering inside walls of one remaining barn I found faded bill-sheets depicting a circle of bearded bandsmen, Civil War veterans who were once touring New York and Connecticut! Back of the crumbling house and chimney, near the overgrown fields where they had once toiled, lay the farm's one-time owners. Beneath headstones gray with lichens lay the remains of Silas and Mary Brown, who had been old in 1823 and 1830 when they were laid to rest.

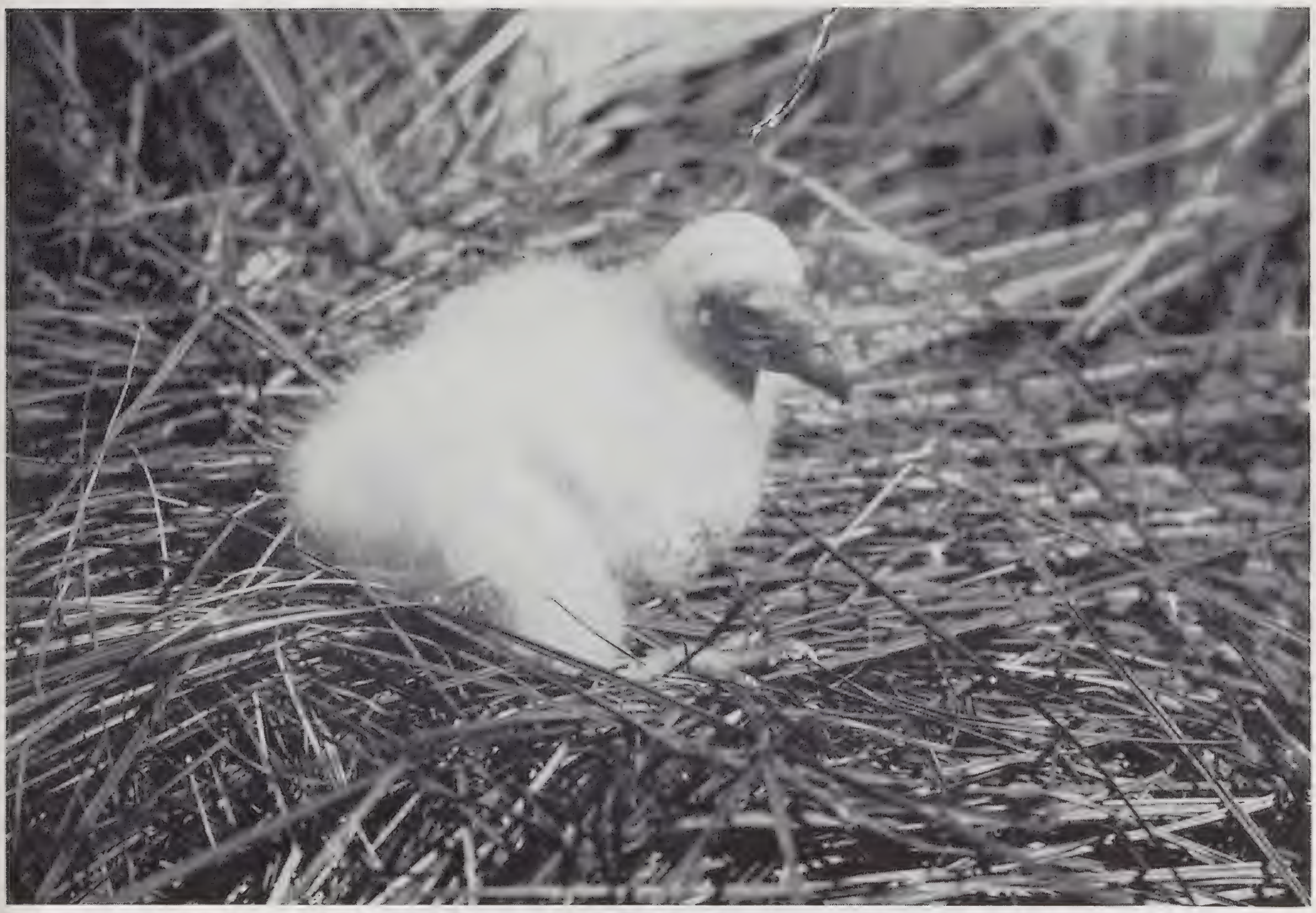
Everything was wild, abandoned and still,

and I sat there for a while trying to visualize this home of Silas Brown's as it once had been. Presently I strolled to the chaotic beauty of a wooded hillside studded with masses of crushed and tumbled glacial rock. It was only a little west of the mouldering farm and my thoughts were still upon its melancholy fate, when all at once an ugly bird, a large black turkey vulture, rose from the rocks in front of me.

It was June and the nesting season. I could hardly believe my eyes, but after a short search among the rocks I found myself staring into a natural cave wherein rested two eggs, the first eggs of this bird which had ever been found in the State of New York.

Lewisboro is approximately four miles from

In this narrow cave, the entrance to which is immediately behind the three figures, near Lewisboro, New York, the author in 1925 discovered the nest of a black turkey vulture, and two eggs—the first ever found in New York.



This downy nestling of the black turkey vulture was probably one of the first of its kind hatched in the state of New York, but since its appearance in 1925 Mr. Howes has logged the bird from nesting sites in various other parts of New York and Connecticut. Now it seems well established as a resident of this area.

the Connecticut state line. Not only was this a record for New York, but it constituted, at the time, the most northerly nesting record.[1]

At first I considered the nest as merely an accidental occurrence, but such was apparently not the case, for during that same summer I found five more vultures summering at Lewisboro and Pound Ridge, while the following year another pair nested and successfully raised their brood near Danbury, Connecticut, and the young were brought to me for identification.

Every year since 1925 I have seen at least one pair of vultures, and in 1938 two pairs were recorded, the first near Oxford, Connecticut, in May, and the second pair, significantly enough, in the summer and again near the site of Silas Brown's old farm at Lewisboro. There are, of course, other records of the bird's occurrence in Connecticut or nearby, but it is only lately that I have learned to expect it as a summer resident, and I would not be at all surprised to find other Connecticut nests during future nesting seasons.

Another bird which has come into Connecticut quite regularly of late years and one which I for one never saw in my most active bird and egg collecting days, is the cardinal, *Richmondena cardinalis cardinalis.*

The species seems to be quite hardy, as most of the inquiries I receive at the museum from people who have seen it, come in fall and early winter, but this year in two cases pairs were seen in very late May, which would indicate breeding individuals.

There are several early records of the bird in the state, but they are scarce indeed compared to the numerous reports now happily adding this beautiful species to our fauna. May it become a permanent breeding member.

In June, 1932, I had the pleasure of finding another apparent newcomer north of its accustomed range. This was a fence lizard, *Anolis carolinensis.*

It is of course possible that this little lizard had been somebody's pet, which had escaped or had been liberated in the spring, yet if this were the case, it is strange that it should be squatting upon a stone of a tumbled down wall upon a wooded New York state hilltop, at an altitude of approximately five hundred feet.

Few people except hunters ever go near this particular spot. In winter, because of the altitude (however slight five hundred feet may seem) the locality is quite a little colder than places nearer Long Island Sound, where, if at all, one might expect to find this lizard so far north of its ordinary range.

In any case, the reptile was sunning himself on the hilltop. As I moved he rushed from his warm rock to the leaves below and through them for a few feet. Then he stopped abruptly and gazed at me out of alert, bright, little eyes, extended his throat-fan somewhat and twitched his front foot after the manner of his kind.

Stealthily I moved toward him, holding my breath for some absurd reason, then I plunged earthward and my lizard disappeared into the wall with plenty of time to spare.

It is true that I have never seen another *Anolis* here since 1932, yet I like to believe that this was not an escaped individual. If the opossum and the turkey vulture have found it possible to move northward, why not the fence lizard also? We shall see, perhaps, as time goes on.

Interesting as these changes or occurrences are, there are still more interesting ones which concern the entomologist.

In passing over the known insect importations, most of which appear to turn into pests, it would be unfair not to say a few words for the oriental praying mantis, *Tenodera sinensis.*

This large and delightfully interesting insect was introduced from Asia in 1896 or thereabouts, possibly in plants, either partly or fully matured, or what is much more likely, in the egg state.

The first of these insects which I found in Connecticut, came from Sound Beach (now old Greenwich), on September 16, 1926, and is now in the collection of The Bruce Museum at Greenwich. Since that time they have multiplied considerably. The big egg masses, which are deposited on twigs and weeds in the fall, evidently withstand our winters with ease, with the result that in recent years we find the mantids and their egg masses in increasing numbers.

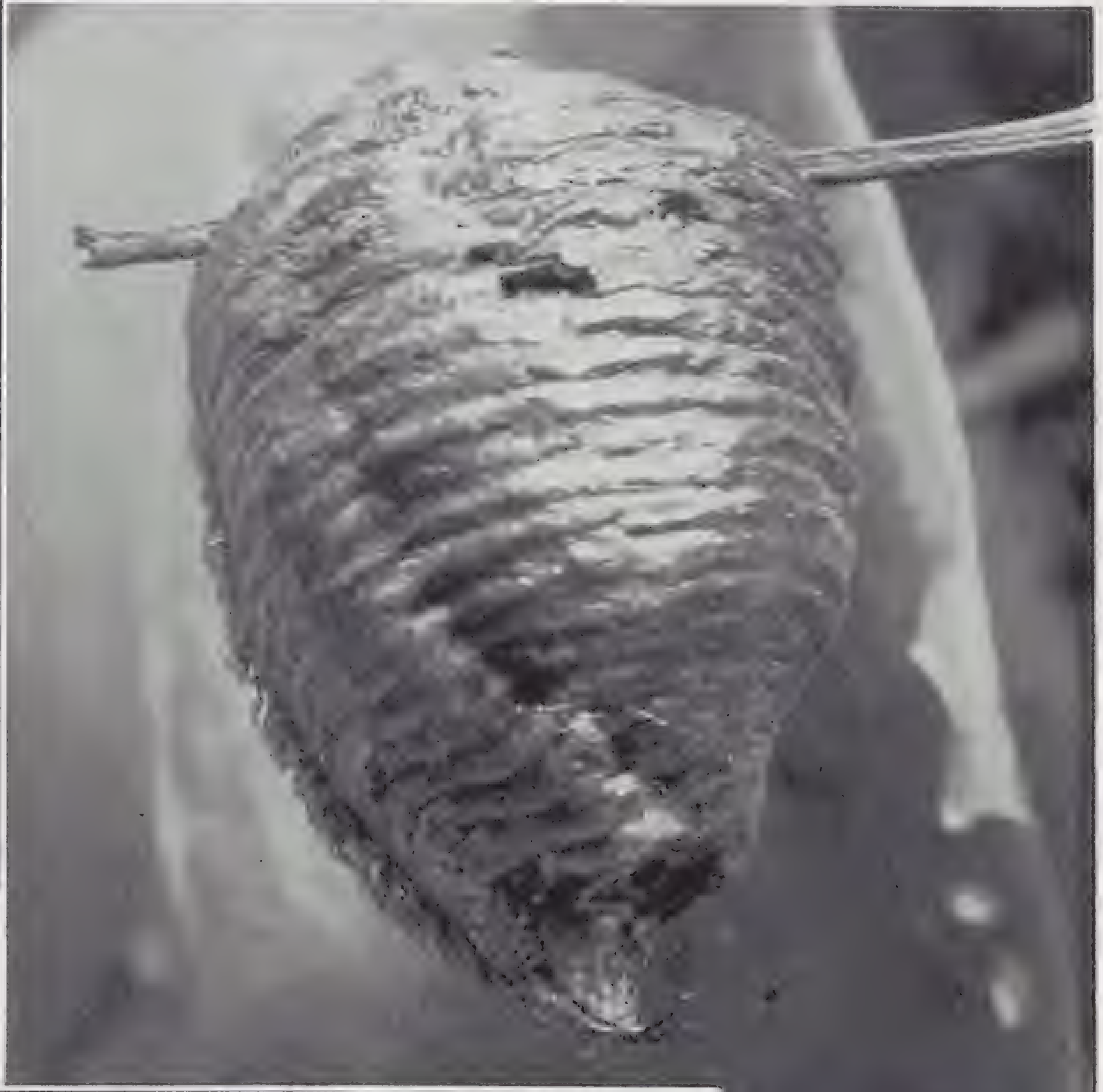
Here at least we have an imported insect which we may cheer for consistently. For its size there is no more ravenous feeder in the world than a

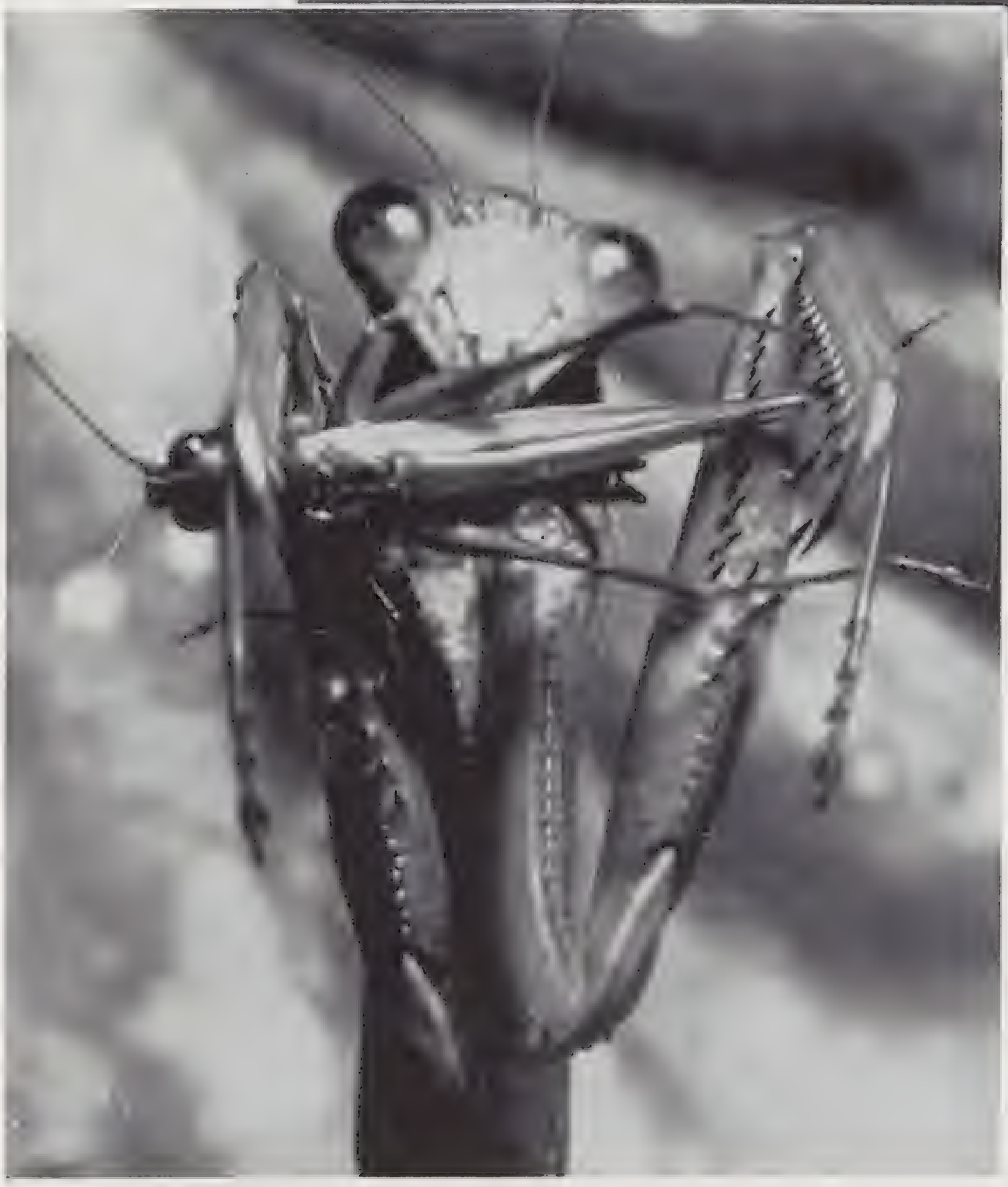
---

[1] *Bird Lore,* Vol. XXVIII, May-June, 1926.

ABOVE — The author tried hard, but he couldn't catch that first specimen of the fence lizard he sighted in Connecticut in 1932. This is a related West Indies *Anolis*.

BELOW — The oriental mantis produces this curious egg-case, which is now often found in Connecticut and New York after the leaves have fallen. In this picture the case is enlarged several times.





RIGHT—The trap is sprung! A mantis has just seized a grasshopper and is preparing to consume it with the greatest relish. With a little imagination, this might be a picture of a man eating corn on the cob.

full grown, healthy mantis, and its diet appears to include all the smaller things which crawl or fly.

Among the butterflies and moths of this region, I have spent many years collecting and making observations. While I realize that a particular collector or observer whose work has been confined to a restricted locality for a quarter of a century or more, may never run across a certain species which a mere beginner may be fortunate enough to obtain almost at the outset of his collecting career, I believe that the cases I am about to mention actually represent definite changes in our insect fauna in Connecticut and southeastern New York. However, observations along the same line from readers of ANIMAL KINGDOM will be extremely welcome.

Until 1933 I had never found that beautiful little red, white and black geometrid moth called *Brephos infans.*

It is supposedly a boreal insect, occurring in New Hampshire, northern Maine and Labrador, but on March 28, 1933, I collected a single specimen at Long Ridge, Connecticut.

Since that time it has increased steadily, and now in March of each year it appears regularly and flies in considerable numbers until the end of April.

The best place to find it is along the edges of old dirt roads on the sunniest mornings during its flight period. Almost every specimen taken is fresh and brilliant and therefore it cannot be a migrant. The moth must be breeding just within and just over the Connecticut line. I have never found it after the end of April.

Likewise during the last few years another little moth, all shining with copper, and studded with yellow and black – *Atteva aurea,* a southerner – has moved northward and now comes commonly to the electric light in a room which I use as an insect trap at my home in Noroton, Connecticut.

A few years ago I had never laid eyes upon *Atteva* in this locality. Today it is three-brooded, apparently, and specimens may be found at various dates from the end of April until the middle of October!

The orange clover, *Colias eurytheme,* is another comparatively recent newcomer to Connecticut in my experience. Prior to 1927 I had never found it here, but during August of that year several were seen and two specimens were captured. Dr. Austin H. Clark of the United States National Museum had already taken it or observed it as far north as Ipswich and Essex, Massachusetts, in August, 1925, as reported in his "Butterflies of the District of Columbia."

After 1927, the species was apparently very rare in Connecticut until 1935; then, in 1936, 1937 and 1938, it increased steadily and now appears to be well established, flying most commonly in August and September in the fields with the common sulphur, *Colias philodice,* until late in October.

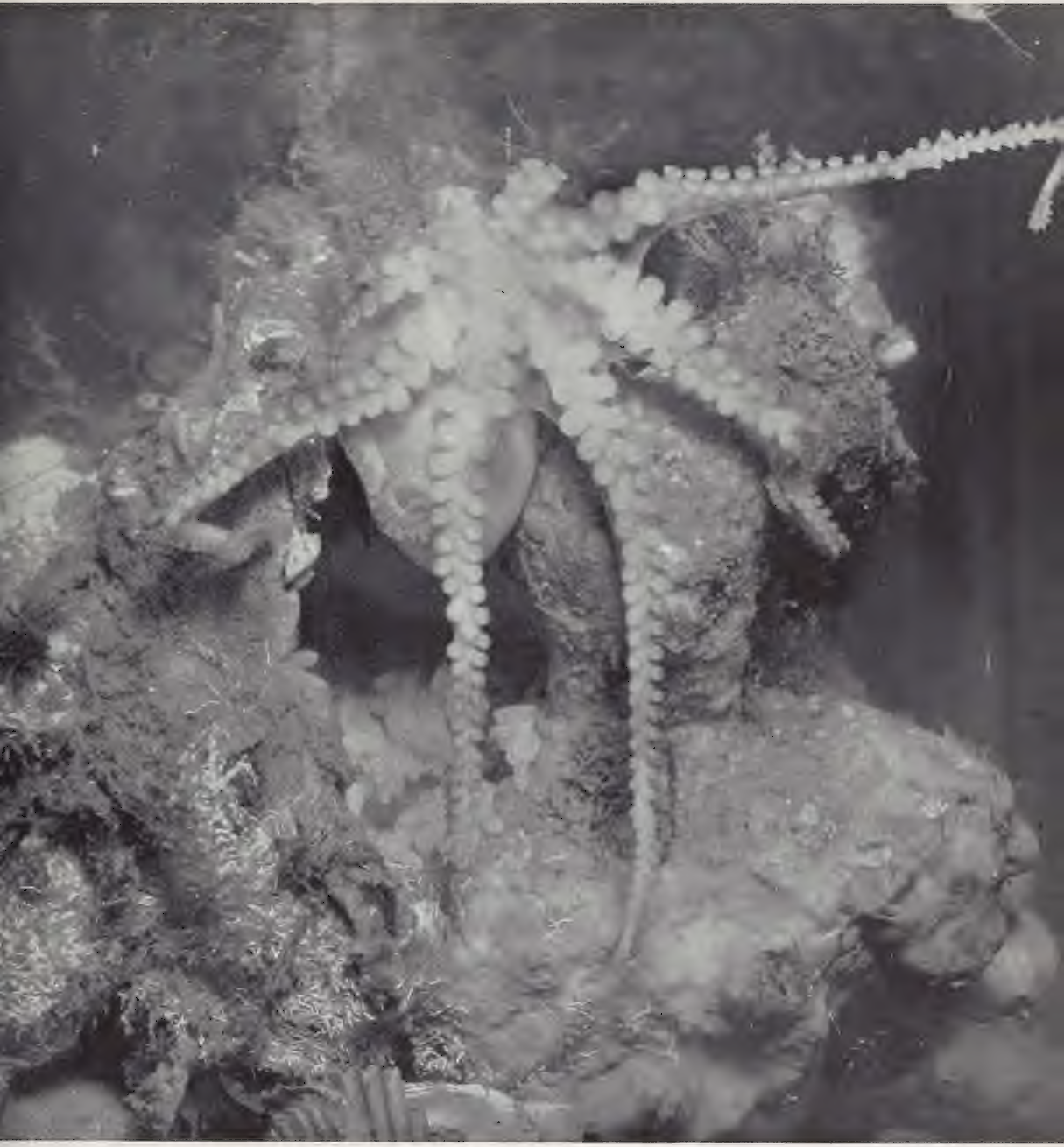
In 1938, the weather having been exceptionally warm until late in the year, both this species and the little moth, *Atteva aurea,* were found as newly emerged specimens as late as November 5.

During the summer of 1912 (unfortunately I cannot give the exact date), I captured a hackberry butterfly, *Asterocampa celtis,* at Stamford, Connecticut. In all my intensive searching thereafter, I never ran across this species again until August 15, 1936. This time I found one in my bedroom at Noroton!

Again in 1937, I collected specimens, and in 1938, 1939, 1940 and 1941, quite a number were seen or taken in Stamford and Greenwich, all around the middle of August, by other collectors and myself.

The range of this butterfly as given by Holland is: "Southern Pennsylvania, Ohio, Indiana and Illinois to the Gulf of Mexico." Here, then, is another species which is apparently pushing northward.

These faunal changes are all of very great interest to the naturalist, but it would be a greater satisfaction were there something really definite with which to correlate them. In reviewing the list – and I would not be surprised if other observers could make additions to it – it is interesting to note that most of the species recorded have been "southerners" which have moved northward. There is, of course, the boreal moth, *Brephos infans,* where the case is reversed, but as for such species as the turkey vulture, the opossum and *Atteva,* it really seems quite remarkable to me that they have been satisfied with our consistently misbehaving climate.

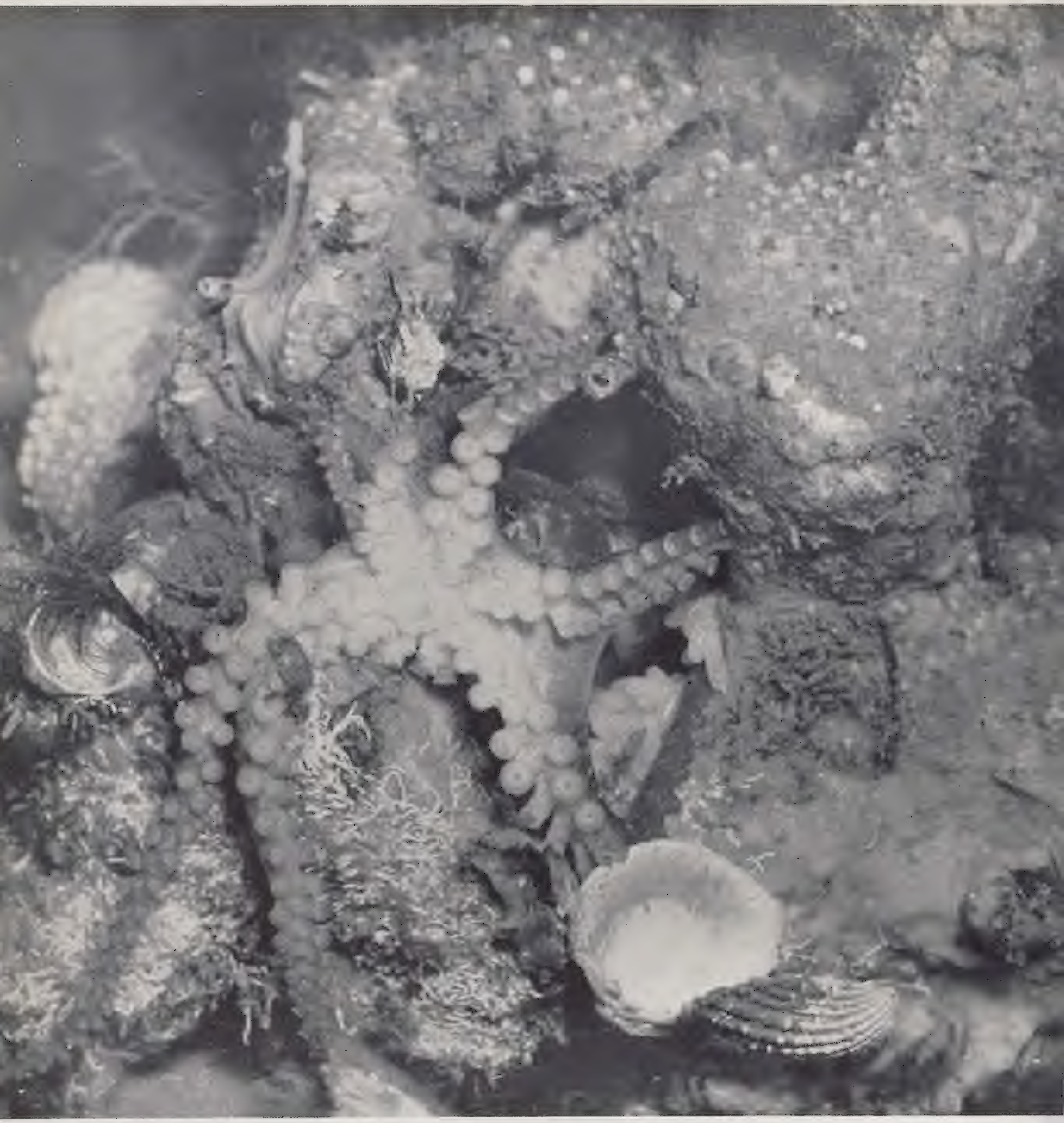


AN OCTOPUS ON GUARD

Notes and Photographs by CHARLES M. BREDER, JR.

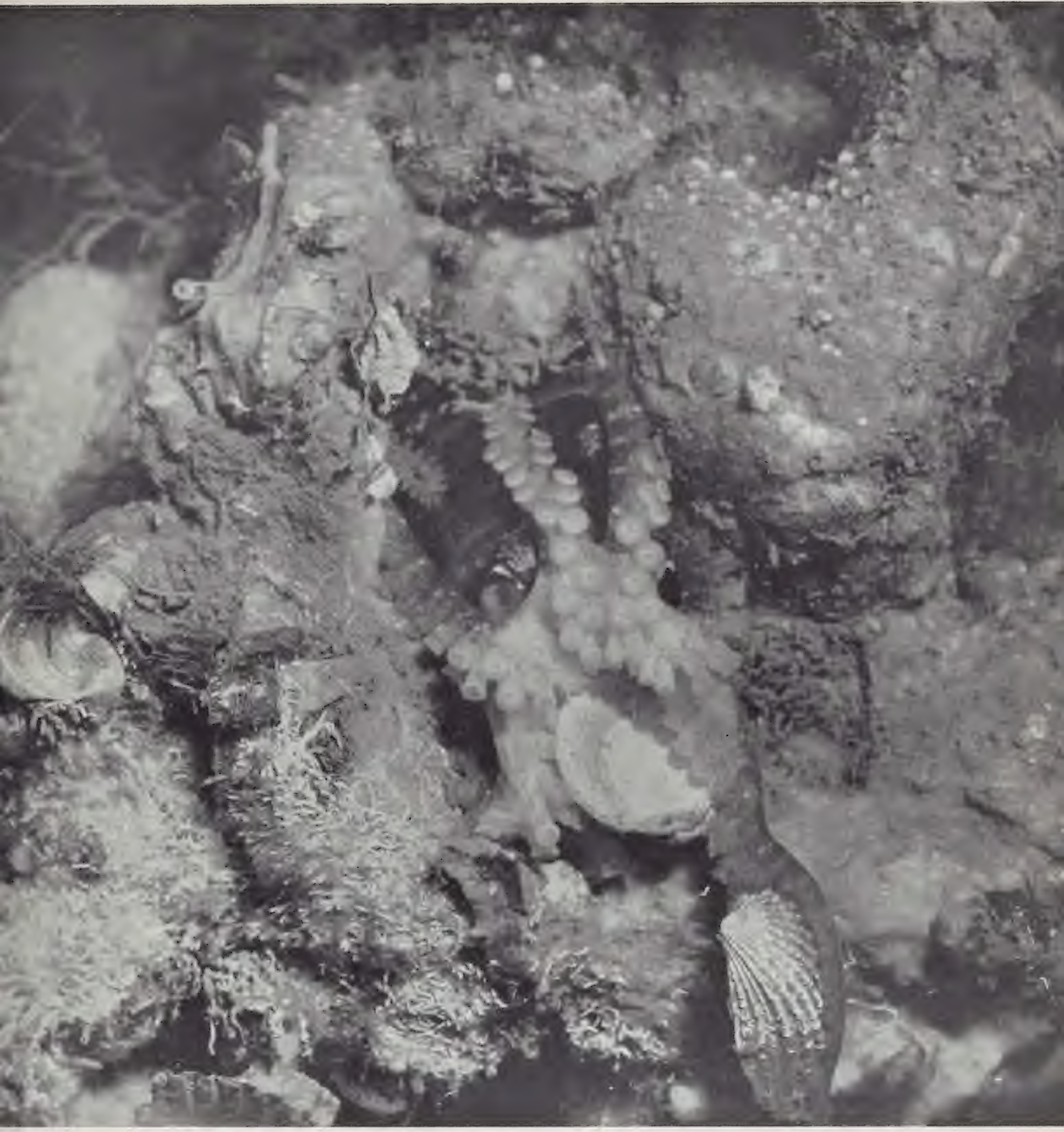
In Pelican Bay near the Aquarium's field laboratory at Palmetto Key, Florida, there is a large sponge bed that has proved to be a valuable collecting site for the laboratory.

The sponges lie in a few feet of water, and dislodge easily. In one sponge that was lifted aboard the collecting boat we found an octopus huddled over its mass of eggs.



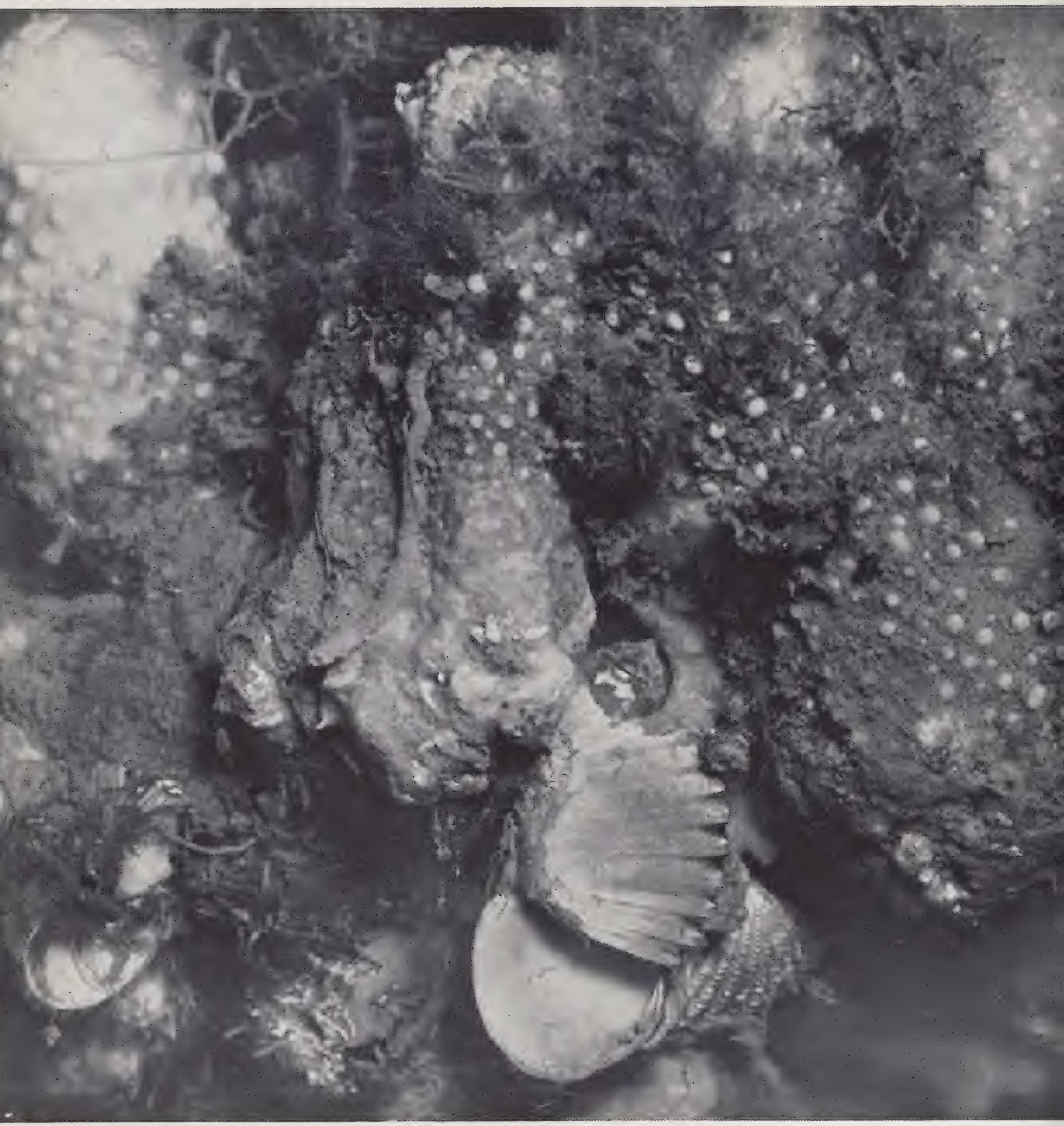
In the laboratory, as in the sponge bed, it almost completely covered itself and the eggs with small shells held up as shields by means of the suction disks on the eight arms. Occasionally the octopus would come out of its cramped quarters, dropping the shells and moving around at no great distance from its milk-white eggs, which can be seen most easily in the first photograph. On reestablishing its guarding position the octopus would drop down over the eggs and reach out an arm to pick up the previously relinquished shells. These it passed up the arm, from sucker to sucker.

At the above stage of the octopus's work on its stronghold, one small shell has been passed part of the way up the arm, and another shell has been grasped by the tip of the arm and is starting toward the center.



Behind the body of the octopus the mass of eggs waved about in the slightest current, for they were attached to one end and hung in small clusters in the sponge cavity.

In the picture above the octopus's body is more or less hidden in the sponge cavity and the covering process is well under way. Usually it took a long time to arrange the shells satisfactorily.



All snug at last! The octopus has withdrawn into the sponge cavity and all the shells are in place, held firmly by the sucker disks. Thus bottled up, the octopus was ready for a long session of pumping water over the eggs and at this stage usually only one watchful, beady eye could be seen — clearly visible here just above the uppermost shell, with part of one tentacle curled around it.

The sponge and its occupant were shipped to the New York Aquarium but the octopus succumbed in a short time. No one has yet succeeded in hatching Florida octopus eggs, apparently, but judging from the behavior of other kinds, the eggs should take a thoroughly long time to hatch, depending upon the temperature at which they are maintained.

Questions Everybody Asks About Snakes. II.

Further Answers to the Inquiries of Visitors About the Lives and Habits of the Reptiles of the World

ROBERT MATHEWSON

[EDITOR'S NOTE: This article concludes a compilation of questions most frequently asked by visitors to the Zoological Park's Reptile House. Mr. Mathewson answered fifty questions in the May-June issue of ANIMAL KINGDOM.]

51. *Do wild animals instinctively fear snakes?*

Not all of them, certainly. Experiments have been made with young monkeys, which showed no fear of snakes until they were placed with other monkeys which became excited. The conclusion seemed to be that the youngsters acquired fear from their cagemates.

52. *In killing its prey, does a big Python crush the animal's bones?*

Not necessarily. Primarily, it kills its prey by constricting the animal so tightly it cannot breathe.

53. *How does a Cobra spread its hood?*

The ribs which project from the vertebrae in the region of the Cobra's neck are quite long, and can be raised at will. This spreads out the skin and thereby forms the hood.

54. *Is there a snake called the Puff Adder?*

That is the common name of a short, heavy-bodied African snake. It can almost double the diameter of its body by drawing in air.

55. *If a person is bitten by a snake, how can he tell whether the snake was poisonous?*

The bite of a venomous snake leaves one or two puncture marks (depending on whether one or both fangs penetrate), and the bite is immediately followed by smarting and pain. The bite of a non-poisonous snake is apt to leave a series of tiny, parallel teeth-marks.

56. *Is there such a thing as a Hoop Snake?*

There is a snake that is often *called* the Hoop Snake, or Horn Snake, but it does not take its tail in its mouth and roll downhill, or "sting you" with the end of its tail. Some standing offers of $1,000 have been made to anyone who could produce a genuine Hoop Snake that would roll downhill, but nobody has ever collected the reward.

57. *Can a snake milk a cow?*

One of the most useful rat-eating snakes in the United States is called the Milk Snake, and is supposed to milk cows. Actually it does no such thing, and neither does any other snake.

58. *How does a snake move?*

Snakes move in three ways: 1, By wriggling the whole body, in S-like curves, with the outer surface of the curves as the pushing points; 2, By looping a coil of the body over the ground in a sidewise motion; 3, By using the broad scales on the belly to draw the body along. This latter method is the one a snake uses when it is moving slowly in a more or less straight line.

59. *How long does the average snake live?*

There are records of some snakes that lived 35 years in captivity. In the wild, the average is probably a good deal less.

60. *How many types of food do snakes eat?*

Essentially only one type—flesh. All snakes are carnivorous and eat such creatures as rats, mice, birds, worms, insects and fish. Some of the larger snakes can eat mammals as large as a half-grown deer.

61. *Do any snakes live in the sea?*

Yes. There are water-dwelling Cobras, for instance, and other purely marine snakes. Some of these snakes even bring forth their young in the water and have developed rather flattened tails that enable them to swim more easily.

62. *What is the difference between frogs and snakes?*

Apart from the differences in shape, which anyone can see by looking at the two animals, there is an important biological difference: Frogs are amphibians, which means that in their early stages of life they dwell completely in the water (tadpoles) and change their form as they become adult, while snakes are reptiles, the young of which have the same characteristics as the adults.

63. *Why is a snake called a cold-blooded animal?*

Because its body temperature is approximately the same as the surrounding air, changing with it instead of being kept at a constant level as is the case with warm-blooded creatures.

64. *How often does a snake breathe?*

Some snakes inhale and exhale about two times a minute, but if the snake is frightened the rate may be increased — or breathing may be suspended for varying lengths of time. Some reptiles have been observed to "hold their breath" for as long as an hour.

65. *If a horsehair is placed in water, will it turn into a snake?*

No. The so-called "horsehair snake" is simply the adult form of a parasite that infests the abdominal cavity of certain insects. It is generally seen only after it escapes into water.

66. *Is it dangerous, on account of snakes, to walk through thick woods?*

Generally speaking, no. If the region is known to be infested by poisonous snakes, if there are known hibernating dens in the neighborhood, it is well to be on the alert. But snakes are secretive in their habits and would rather hide than expose themselves.

67. *Is is possible to exterminate poisonous snakes in a restricted area?*

It probably could be accomplished, at least temporarily, by systematic killing of every poisonous snake seen, the dynamiting of known snake dens and the destruction of all sources of food. But it would be a pretty big job, and there is always a likelihood that after one's vigilance was relaxed, snakes would come back to the area.

68. *Is there any general and obvious way of telling a poisonous snake from a non-poisonous one?*

No.

69. *Have snakes any economic value other than in medicine and rodent control?*

The skins of some snakes are used in the leather industry.

70. *Do snakes have vocal cords?*

No. However, a number of snakes can make sounds by rapidly expelling the breath, and the Cat Snake of Malaysia makes a sound very much like the meouwing of a cat.

71. *What is the longest snake?*

The Regal Python. It appears to reach an extreme length of about 30 feet.

72. *Do snakes shed their skins at any particular time of the year?*

No. Shedding is influenced by several factors — feeding, lacerations, glandular disturbances — and may occur only once or as many as five times a year.

73. *If a snake's head is cut off, is it true that the snake will not die until sundown?*

No. The movement of the body after decapitation is merely a muscular reflex. This does not mean that the snake is still alive, but simply that the nerve tissue controling the muscles is reacting to shock.

74. *Is there a snake called a Joint Snake, that will come together again if it is cut in pieces?*

The so-called "Joint Snake" or, to give it another common name, the Glass Snake, is a legless lizard. If the tail is broken off it does not rejoin, but a new, stumpier tail grows out.

75. *What part have snakes played in religion?*

Snakes have had religious significance among certain peoples since very ancient times — among the ancient Egyptians, for example, and among the Hopi Indians and some African tribes even today.

76. *Is there a snake called the Whip Snake?*

Yes — but it doesn't whip people with its tail, as some people believe. The scales on the snake's tail resemble a braided whip. It is generally called the Coachwhip Snake, and the eastern form ranges from North Carolina to Florida, and westward.

77. *What was the snake that Cleopatra used to kill herself?*

It might have been the small and deadly sand viper, *Vipera vipera*. In Cleopatra's day people didn't worry much about scientific classification of snakes, or furnish detailed descriptions.

78. *Can snakes live in cold climates?*

It depends on how cold is "cold." Snakes are able to live in northern Maine and lower Canada, where the winters are quite cold. In winter they seek hiding places below the frostline; otherwise they would freeze and die.

79. *What happens during the winter to snakes that live in a temperate climate?*

They spend the winter in a semi-torpid state, underground, where the temperature never falls low enough to kill them. This is called hibernation.

80. *Do snakes have eye-lids?*

No. The eyes are provided with transparent membranes called eye caps.

81. *Where does a snake's body end and its tail begin.*

The body consists of the region from the head to the vent; the tail is the remainder of the snake.

82. *Do any poisonous snakes grow as large as the longest non-poisonous ones?*

No. The largest poisonous snake is the King Cobra, which reaches about 18 feet. Several of the pythons, non-poisonous, exceed that length.

83. *Where does the Bronx Zoo get snakes for its collection?*

From dealers in wild animals, who send out collecting expeditions, or by gift or purchase from amateur collectors, or from its own staff members who make special collecting trips.

84. *Can a snake be tamed and kept as a pet?*

Many people keep snakes as pets. They are not particularly demonstrative, as cats or dogs or monkeys might be, but they still deserve the name of pets.

85. *Could a snake kill an elephant?*

There are reliable reports of elephants being killed by King Cobras, which bit the big pachyderms between the toes.

86. *What constitutes the poison apparatus of a snake?*

The venom is stored in glands in the snake's head. These connect by means of ducts with the fangs — two hollow teeth set in the forward part of the mouth. When the snake bites and the teeth enter the prey, the glands are squeezed, the poison is forced out, and flows through the ducts and fangs into the wound.

87. *Will snake poison kill you if you swallow it?*

Probably not, but there is some doubt about the effect. Snake venom is designed to act when it enters the bloodstream, and swallowing it sends it directly into the digestive system instead. But there might be sores in the mouth, or ulcers in the digestive system, which would allow it to get into the blood before it was changed by digestion. Furthermore, nerve-destroying type of venom may act through a mucous membrane, so it would present a definite danger if taken into the mouth.

88. *Does a poisonous snake have to strike in order to bite?*

No. Striking is the usual method with most poisonous snakes, but they can simply reach out and bite, deliberately, if they want to.

89. *What is snake venom?*

All snake poisons are proteins, although none have been completely broken down and analyzed.

90. *Do poisonous snakes have other teeth beside the fangs?*

Yes. There are two or four rows of small, backward-curving teeth in the upper jaw, (depending on the type of poisonous snake), and two rows of teeth in the lower jaw. These small teeth are solid — not hollow, like the fangs — and are not poisonous.

91. *Is it true that if you see a snake, its mate is likely to be nearby?*

Snakes do not usually travel in pairs. During the mating season in the spring a pair might be found together, or near each other.

92. *Do any snakes live in trees?*

Many kinds of snakes spend most of their lives in trees or low shrubs. They are usually slender and very agile snakes.

93. *Does a snake have a backbone?*

Yes.

94. *Do snakes take care of their young?*

Most snakes show no signs of having parental instincts, and leave the young to take care of themselves.

95. *Can snakes be eaten as food by human beings?*

Yes. In recent years Rattlesnake meat has been canned and sold — mostly, however, to people who want to startle their friends.

96. *Why are snakes shown on the Aesculapian staff, the insignium of medicine?*

Aesculapius, in Greek mythology, was the tutelary god of healing, and the serpent was his emblem.

97. *How does a snake sleep?*

In almost any position — coiled, more or less straight out, or in irregular curves. The eyes are not closed when the snake sleeps, of course, since it has no eyelids.

98. *Do snakes have a sense of smell?*

Yes. Odors register on an organ in the roof of the mouth, after being taken in through the nostrils.

99. *Do snakes possess internal organs similar to those of man?*

Yes. However, most of the organs are long and slender, to conform with the shape of the snake.

100. *How should you treat the bite of a poisonous snake?*

First: Make a tourniquet (a handkerchief, a belt, a necktie, a strip of cloth will do) and apply it about 4 inches above the site of the bite. Slack this off for about a minute every 20 minutes.

Second: Make a cut about half an inch long and from a quarter to half an inch deep (depending upon the site and depth of the bite) over each fang puncture. Cut with the muscle, not across it.

Third: Start suction of the bitten part — with the mouth, if practicable and you are reasonably sure the mouth does not have cuts or sores that might absorb the venom — or with any of the various mechanical suction devices that may be available. Suction bulbs come with "snake bite kits," or in a pinch an inverted pipe bowl has been used. Keep up the suction until the case is turned over to a doctor — for hours, if necessary.

Fourth: Anti-venomous serum should be administered by a physician. In an emergency, where no doctor is likely to be available for many hours, it may be advisable to administer serum without waiting. Full directions come with the tubes of serum. But in general it is better to let a doctor make the injection.

Birds Astray

Curator Crandall Is a Kind of Travelers Aid Society for Feathered Waifs and Strays in This Area

WILLIAM BRIDGES

A BIRD OF PARADISE flew through Wall Street one day and, instead of simply rubbing their eyes and taking it as an omen of better times on the stock market, two office workers jumped for the telephone and called Curator Lee S. Crandall. For Crandall, over a good many years, has become a kind of one-man Travelers Aid Society for lost birds in the big city.

The number of owls he has rescued from basements, bedrooms and fire escapes is prodigious. He has befriended pheasants, hawks, ducks, humming-birds and a host of commoner feathered citizens that ought to know their way around New York, but sometimes don't. Like the organizations that help human strays, he provides temporary shelter and food and then he sets the lost ones on their way – or occasionally gives them a permanent home in the Zoological Park's bird collection.

That Bird of Paradise was not destined for the Zoo, however. Through Crandall it was restored to the animal importer from whose cages it had escaped.

The episode illustrates something that Crandall has noticed time after time. It was the way in which the bird was reported to him. A man phoned from the thirty-second floor of an office in the financial district:

"There's a bird on my windowsill that must have escaped from the Zoo. It's about the size of a pigeon, and it's brown with a fluffy yellow tail and a long, curved beak."

Now, nine times out of ten city-dwellers who call up to report a strange bird in their vicinity start off by surmising that it "must have escaped from the Zoo." If Crandall were sensitive about such things, he might wonder what kind of a caretaker the public thinks he is, to let his birds escape so frequently. Actually, although there are more than seventeen hundred birds in our magnificent collection, there have probably not been a dozen escapes in almost forty years – and some of those voluntarily returned.

The real reason is that most city people are familiar only with the common, somberly-colored birds of the city, such as pigeons, sparrows and occasionally starlings. Brilliantly colored tropical birds they are used to seeing in the Zoo. Consequently, when a suburban flicker or a countrified night heron strays into the city, its unfamiliar colors mean "escaped from the Zoo" to city folk.

With equal regularity, people reporting stray birds describe them in such a way that it takes all of Crandall's ingenuity to figure out what they are talking about. That Bird of Paradise, for instance.

"About the size of a pigeon, brown, with a fluffy yellow tail" is a good general description of either the Greater or the Lesser Bird of Paradise, and one that the Zoo's Curator of Birds would recognize instantly, since he went to New Guinea some years ago after Birds of Paradise and has the best collection of them in the world. But " a long, curved beak" threw him completely off. The Greater and the Lesser have beaks about an inch and a half long, and fairly straight. That, apparently, seemed "long" to the man in the downtown office, but to Crandall a "long, curved beak" is something like the one on the Long-tailed Bird of Paradise. Its beak is about three inches long, and sickle-shaped.

However, in the case of the Wall Street bird, Crandall knew that an animal importer had a Lesser Bird of Paradise, and from the description of the color he guessed it was that bird, beak or no beak. He phoned the animal dealer, learned that his Bird of Paradise had escaped the day before, and was able to tell him where it could be found.

Crandall still laughs about the time, some years ago, when a reporter on a New York newspaper phoned him that a big bird had flown into the newspaper's City Room – and would he tell them what it was? The description that came over the phone was all but meaningless, since the reporter seemed to know very little about the anatomy of a bird, but in the end Crandall made a tentative suggestion that it might be a hawk – perhaps a sparrow hawk.

The next edition of the paper carried a two-column picture of the bird, with a caption saying that "Curator of Birds Crandall had identified it as a Sparrow Hawk."

"And the funny part of it was," Crandall says with laughter, "it *was* a sparrow hawk!"

A woman telephoned him from Long Island one day to say that a strange bird had flown down her chimney and was in the house. She wanted to know what kind of a bird it was.

"Well, what color is it?"

"It's mauve, with dark spots."

That had him stopped. He asked for a detailed description, but it always boiled down to "mauve with dark spots."

Finally the woman explained that there were hundreds of the same kind of birds in the fields outside, all walking and pecking through the stubble. That completed the picture.

"It's a starling," Crandall informed her. "But if you'll look again, you'll see that it's *dark,* with *mauve spots,* instead of the other way around."

Later the woman sent the bird to the Zoo, and Crandall's diagnosis proved to be perfectly correct. It was a starling in late summer plumage – dark, with slightly mauve spots or speckles.

Most of the commoner birds from the country that wander into the city and eventually reach the Zoological Park are taken back to the country and turned loose. But sometimes they are kept as exhibits, and the Curator of Birds is extremely glad to have them.

The Ruby-throated Hummingbird, so common in suburban flower gardens, is a bird that is perpetually fascinating to our visitors but one which Curator Crandall has never been able to exhibit except by chance. His first one came in 1913. One summer afternoon an Italian came to his office with a little Ruby-throat in a quart milk bottle. He had caught the bird in his garden in the country above New York City, and made a special trip down to the Zoo with it.

That bird lived only nineteen days, but it attracted a great deal of attention because many people had never seen a hummingbird close at hand. The Zoo had no more Ruby-throats for twenty-three years. Then, on September 5, 1936, a stenographer telephoned from a downtown office that a humming-bird had flown in her window. A man from the Bird House staff hurried downtown and caught it. Fifteen days later another hummer flew into an apartment on upper Broadway, and the Zoo had another fine exhibit.

Hummingbirds have long since ceased to be a novelty in the Bird House – especially since the arrival of the Colombian collection this winter – but the common little Ruby-throats are still highly desirable. Some years several of them are caught by Bronx merchants or housewives and turned over to the Zoo; other years there is a scarcity and the Bird House is lucky if it manages to keep one specimen on exhibition. Twenty-two months is the longest period we have ever kept a Ruby-throat alive. Probably we will keep these delicate little birds even longer in future years. Even before the present display was built, we kept a Ricord's Emerald for three years and three months – a world's record at the time.

In certain years almost every bird that is reported is an owl. The reason seems to be that owls migrate irregularly, but there seems to be no satisfactory reason why so many of them in the course of a few weeks should drop down in the heart of a big city. Sometimes owls move about a good deal in search of food, and it is probably in the course of those wanderings that they become dazzled by the lights of the city and find themselves on fire escapes or in houses – generally frightening the wits out of superstitious people who think an owl is a symbol of bad luck.

Usually when there is a distracted human and an owl at the other end of the telephone line, Crandall is implored to send somebody to get the bird or to frighten it away. He learned long ago that it was a waste of time to send anybody unless that owl actually was in captivity – in a room with the windows shut, or caged in some manner.

"Around Christmas one year," he said, "an excited woman called up and said there was an owl on her fire escape and it was freezing to death. She wanted to know what she should do. I started to tell her, but each time she broke in to say she'd called the S.P.C.A. and they didn't think she needed to do anything, and she'd called the police and they wouldn't send a patrolman to get the owl.

"Well, I finally made her understand that the S.P.C.A. and the police weren't really heartless, and that the bird certainly wasn't freezing to death, even though it was a cold afternoon.

"I could hear her talking to someone in the room, and so I suggested that if she could catch the owl, I'd send down for it. She said her little son was right there and he'd catch it. I told her to get a box.

"I heard her tell 'Freddy' to go out in the kitchen and get the box that had the pretzels in it. Freddy came back, and then I instructed them to open the window slowly, hold the box above the bird, and bring it down slowly until they could pop it over him.

"Well, I waited and waited. I could hear the window squeak, and whispers, and Freddy's mother giving directions. Then I heard the little boy shout – 'I got – oh, Mummy! He flew away!'

"I put my hand over the telephone and laughed and laughed. The woman came on the wire a moment later and said 'Oh, thank you! Thank you so much!' I didn't quite know what she was thanking me for, but I told her that was quite all right – glad to be of assistance, and she hung up.

"I suppose she was grateful because my instructions made the bird fly away and she wouldn't have to watch it 'freeze to death' on her fire escape.

"At any rate, experiences like that show you why I won't send a man downtown until they've actually got the bird in hand!"

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

NEWS FROM "UMBRELLA BIRD CAMP"

In a letter headed "Umbrella Bird Camp, around the beginning or middle of May," the Zoological Society's bird collector, Charles Cordier, has written to report astonishingly good success in his collections in Costa Rica.

M. Cordier, the collector who brought back a magnificent series of hummingbirds and the first specimens of the Scarlet Cock-of-the-Rock in December, returned to the American tropics in March and has been working constantly in Costa Rica. His latest letters report that he has two male and one female specimens of the famed Umbrella Bird which has never been exhibited in any zoological park.

Almost equally startling was his announcement that he has five male and four female Quetzals – the birds that are often called "the most beautiful birds in the New World." The first living specimens exhibited in a zoological park were seen here in 1939.

M. Cordier also had, at the date of his last letter on July 12, about twenty hummingbirds. He expected to capture several more.

Writing from "Umbrella Bird Camp" somewhere in the Costa Rican bush, M. Cordier commented:

"After an intensive search in the Caribbean lowlands of Costa Rica lasting three weeks, I finally saw my first Umbrella Bird. But between seeing and capturing this bird–whoever says it is dumb ought to be prosecuted for slander. There is a big difference. Also to my sorrow I found that because of the wing span and big size of the bird, the pocket nets suitable for the Cocks-of-the-Rock are no good for this customer, which invariably extricates itself from the too-shallow pockets.

"In ten days of living on the very wet Umbrella Bird ground I caught one bird with birdlime. After cleaning it for an hour, I tied its wings up with adhesive tape from a Five-and-Ten-Cent store – and the bird got away in a fraction of a second. I can assure you that Five-and-Tens have lost a customer for this commodity."

A few days later another letter arrived from M. Cordier saying he had gone to San José to get yarn to make proper nets to catch Umbrella Birds, and had a whole native family hard at work knotting the nets. In the meantime he had captured one bird, which "is now so tame that it never shows its umbrella, which is its chief attraction and is probably used to frighten an occasional enemy."

It is still uncertain when M. Cordier will be able to bring his great collection of birds to the Zoological Park, because of war-time restrictions on travel. It is possible that he will arrive in August, but the birds are apparently healthy and contented and no attempt will be made to bring them here until travel is safe.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Life

Rt. Rev. Robert I. Gannon

Annual

Max Abramovitz
Joseph A. Connell
J. Andre Fouilhoux
Mrs. Wm. Barclay Harding
Edward Helme
Mrs. Victor Morawetz
Ector Munn
Bradford Norman, Jr.
Dr. Arthur Stein
Mrs. Lewis Barclay Harding
Cornelius VanderPyl

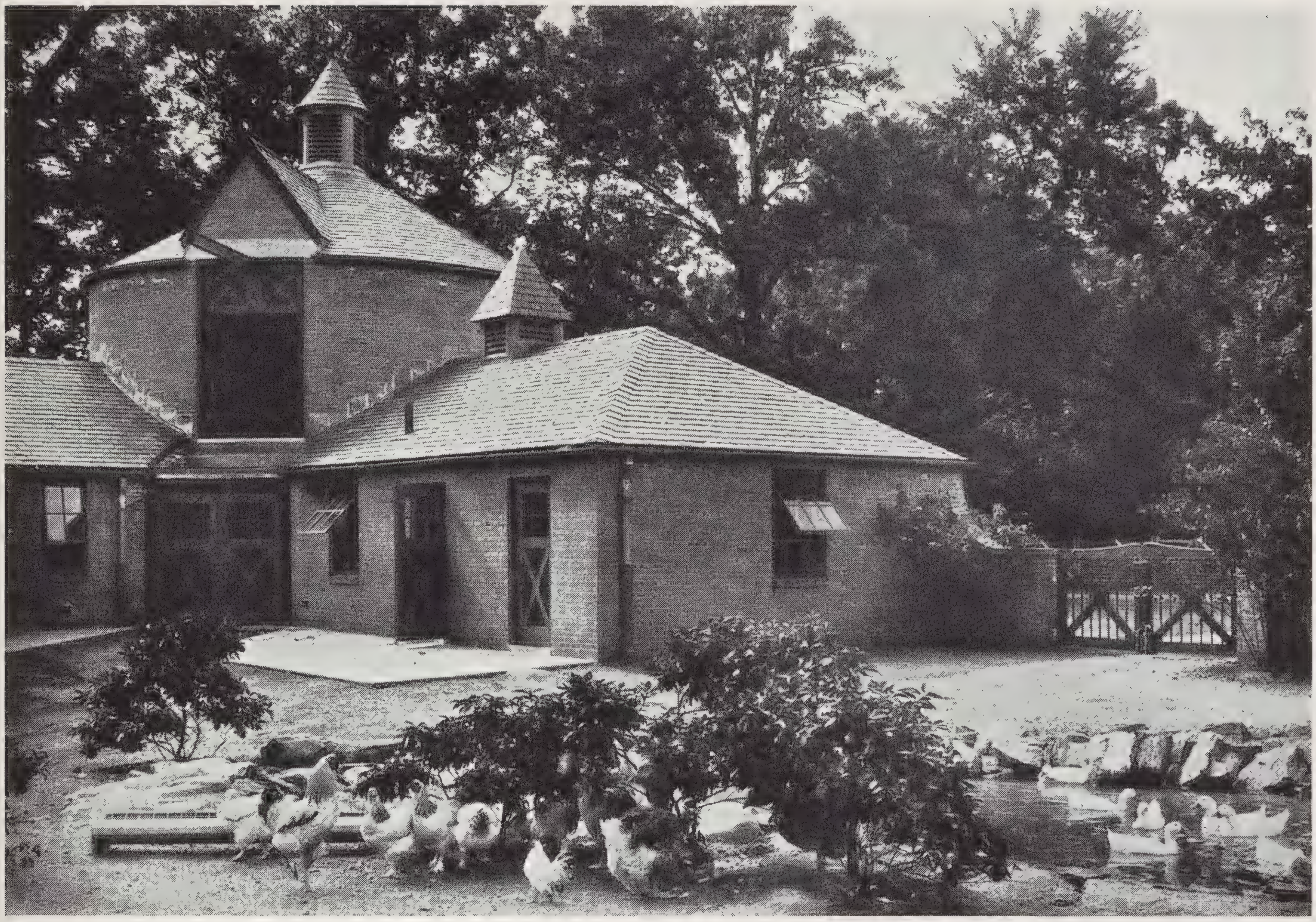
Junior Members

Emil Nassau
Jay Zemel

ACTING CURATOR OF REPTILES

John Tee-Van, Executive Secretary of the Zoological Park, was appointed Acting Curator of Reptiles on June 15, succeeding Dr. Ditmars.

Mr. Tee-Van has been on the staff of the Zoological Park since 1911 when he became an assistant keeper in the Bird Department. In 1916 he joined the Department of Tropical Research under Dr. Beebe, and in the past twenty-five years has made more than twenty expeditions to South America, Central America, the Galápagos Islands, the West Indies and areas of deep-sea investigation in the Atlantic and the Pacific. His most dangerous expedition was the one success-



A section of the barnyard at the Farm-in-the-Zoo, looking across the Duckpond toward the barn that houses the larger livestock — Jersey cows and calves, a Belgian mare and foal, the Horned Dorset sheep and the Nubian goats. The bulkier items of the food supplies are kept in the second story of the round house in the center.

fully completed last December, when he returned from China with the two baby Giant Pandas presented to the Zoological Society by Mme. Chiang Kai-shek and Mme. H. H. Kung through United China Relief.

"FARM-IN-THE-ZOO"

The opening of major new zoological exhibits must necessarily be so rare in these times that the inauguration of our "Farm-in-the-Zoo" on July 11 will stand out in the record of the year.

The Farm lies on a tract of gently rolling, wooded land in the northeast corner of the Zoological Park, just off of Boston Road. Construction was started almost two years ago after a strip of the Zoological Park was surveyed for the Bronx River Parkway extension, which will eventually cut through the group of service buildings in use for many years as a nursery for the Zoo gardens and a breeding station for small animals. Plans for a Normandy type of farm buildings were prepared by the Park Department, which supervised the actual construction by WPA forces.

Announcing the opening of the Farm, President Osborn commented that "For more than forty years we have had a strict policy of exhibiting only wild forms of animal life, and whenever possible the rarer forms." About a year ago, however, "we made a brief exhibition of domestic breeds of beef and dairy cattle, alongside their primitive wild ancestors, and the comments we heard around the corral fences gave us an idea that there are many persons in New York to whom a Jersey cow is just about as strange and rare as a Malay seladang."

Consequently it was decided to make the Farm a major exhibition unit, and to stock it with as many as possible of the types of animals that would be found on a typical American farm — horses, cows, pigs, sheep, goats, chickens, ducks, guineafowl and pigeons.

"By exhibiting domestic animals we are not really getting away from our purpose of showing the wide range of wild animals of the world," Mr. Osborn said. "Every animal in the Farm-in-the-Zoo is descended from wild, primitive forebears that were at home millions of years ago in a vanished world. We call them 'domestic' animals today, but man and natural selection, working on the wild stock, have made them the varied, useful animals they are today."

Most of the exhibition animals on the Farm-in-the-Zoo were lent to the Zoological Society by generous friends. Interest in the exhibit has been astonishingly great; editorials concerning the new venture appeared in three New York newspapers and attendance has been running from 300 to more than 3,000 visitors a day.

TECHNICAL PAPERS

During 1942 the New York Zoological Society will publish the twenty-seventh volume of its technical journal, ZOOLOGICA. Since the quarterly is available only on subscription ($3 a year) and its contents are likely to appeal chiefly to specialists in various fields of zoology, the general membership of the Society is not well acquainted with one of the Society's publications which enjoys an excellent reputation in the scientific world.

In the future, ANIMAL KINGDOM will publish a list, by titles only, of papers appearing in ZOOLOGICA. The following were published in Vol. 27, Part 2, on July 20:

9. Notes on Tschudi's Types of Peruvian Birds. By Herbert Friedmann and H. G. Deignan.
10. A Revision of the Kingfishers, *Ceyx erithacus* and *rufidorsus*. By S. Dillon Ripley.
11. On the Reproduction of *Gobiosoma robustum* Ginsburg. By C. M. Breder, Jr.
12. *Trichodina spheroidesi* and *Trichodina halli* spp. nov. Parasitic on the Gills and Skin of Marine Fishes, with Special Reference to the Life-history of *T. spheroidesi*. By Morton Padnos & Ross F. Nigrelli.
13. Mortality of Albino Embryos and Aberrant Mendelian Ratios in Certain Broods of *Xiphophorus hellerii*. By Myron Gordon.
14. The Schooling Behavior of Mackerel: A Preliminary Experimental Analysis. By Arthur Shlaifer.
15. Food, Eggs and Young of the Carnivorous Snail, *Euglandina rosea* (Ferussac). By William Marcus Ingram & Walter Edward Heming.
16. The Anatomy and Morphology of the Hypophysis of Several Species of Ovo-viviparous Poeciliids. By Hugh E. Potts.

* * *

"Nellie," a Griffon Vulture, the oldest bird in the Zoological Park's collection, will celebrate her fortieth year in the collection on August 23. Still in excellent health (despite an attack of bumblefoot two or three years ago), Nellie is spending the summer in the open air, on the African Plains, and appears likely to remain on exhibition for many years to come.

PUBLICATIONS OF INTEREST

PRAIRIE DOG TOWN. By Margaret Thomsen and Raymond and Carl O. Mohr. Dodd, Mead & Co., New York. 56 pp. $1.50.

Here is a little book that gives an authentic life-history story of one of our smaller but most oddly-appealing native American mammals. Except at a zoo, few of us have ever seen a prairie dog village and it must be confessed that the Bronx Zoo's version of such a village can merely indicate the possibilities of the real thing, so well described and illustrated in this book.

Early settlers of our western plains region marveled at the extent and number of the "dog towns" in their new land, and large "towns" still exist where conditions are suitable.

"Prairie Dog Town" shows what an extraordinary amount of energy, watchfulness and courage must be expended by these animals in order to maintain themselves. The prairie abounds with rattlesnakes, coyotes and badgers, all deadly enemies. In spite of these, the little prairie dog (of course it is not a dog at all, but a squirrel), manages to live an apparently care-free life.

The illustrations are excellent. This is an A-1 book for young readers.—C. W. L.

CHILDREN'S ZOO. By Katherine Southwick Keeler. Illus. by the author. Thomas Nelson & Sons, New York. 40 pp. $1.00.

[*Reviewed by Ann Leister, sometimes Zoopervisor at the Children's Zoo*].

"Children's Zoo" is a delightful book, for little folks between the ages of six and eight. Younger boys and girls would also enjoy it because of its pictures, which are truthful reproductions of the real Children's Zoo.

Anyone who has visited the Children's Zoo will remember it when they see the pictures.

The story tells that one Sunday Mr. Smiley saw an article about the Children's Zoo in the morning paper, and Janie and Jimmy and Mrs. Smiley were eager to go.

At the Children's Zoo they came to a low bridge, which was the entrance. Janie and Jimmy had a wonderful time that day. They looked at everything there was to see. They played with all the animals in a big ring filled with straw. They looked into all the animal houses, and Jimmy took one of the goats for a walk. That was a lot of fun. On their way out, Janie and Jimmy got a medallion as a souvenir of the Children's Zoo.

BOOK BARGAINS

Publications of the New York Zoological Society
Offered at Savings of 50¢ to $1.50

THE AMERICAN BISON

By Martin S. Garretson

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for the first accounts of its appearance and habits, pictures its wide range and incredible numbers. It sets forth authentically the natural history of the animal, describes the tragic course of extermination that ranged unchecked until there were only 1,091 bison left in the whole of North America, and then it tells of the rise and development of a strong national sentiment that saved the species from extinction. *254 pages, 65 illustrations.*

Was $2.50 . . . . . Now $1.50

PETS AND HOW TO CARE FOR THEM

By Lee S. Crandall

As Curator of Birds in the New York Zoological Park, Mr. Crandall has responsibility for the diet, health, cage conditions and general well-being of some 2,000 birds of many species. Out of his experience with the Zoological Park's collection and a life-long enthusiasm for pets of every kind, he has written a completely authoritative and practical book on pets and their maintenance in good health. He devotes individual chapters to Dogs, Cats, Domestic Rabbits, Small Wild Animals, the General Care of Birds; Pheasants, Peafowl and Guineafowl and Quail, Waterfowl, Parrots, Cage Birds, Canaries, Domestic Pigeons, the General Care of Fishes and Aquarium Fishes. *296 pages, 96 illustrations.*

Was $2.00 . . . . . Now $1.00

PRESENT DAY MAMMALS

By Claude W. Leister

Students in Zoology and Biology classes and the general reader who has often been puzzled by the relationship of animal groups will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. It answers such questions about mammals as: What does it look like? How big is it? To what is it related, and why? Whence does it come? Typical representatives of every Order of mammals are pictured here, accompanied by a clear text explaining the zoological status of the animals. *74 pages, 106 illustrations.*

Was $1.00 . . . . . Now 50 cents

Order from:
Department B, Zoological Park, Bronx Park, New York City
(Make checks payable to New York Zoological Society)

NEW YORK ZOOLOGICAL SOCIETY
FOUNDED 1895

XLV • No. 5 SEPTEMBER–OCTOBER 1942

90.673
A59

ANIMAL KINGDOM

SMITHSONIAN INSTITUTION
OCT 7 1942
E
NATIONAL MUSEUM

BULLETIN, PUBLISHED BY THE
NEW YORK ZOOLOGICAL SOCIETY

RAREST PHEASANT IN THE WORLD, *Jean Delacour* • REPORT ON THE GIANT PANDA
ard Goss • FATE OF THE GALÁPAGOS TORTOISES, *C. H. Townsend* • PARK HAPPENING

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

ASST. TREASURER
City Bank Farmers Trust Company

EXECUTIVE COMMITTEE

Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
De Forest Grant
David H. McAlpin
Robert Moses
Fairfield Osborn

BOARD OF TRUSTEES

Class of 1943

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert I. Gannon
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

William Bridges	*Editor & Curator, Publications*
Jean Delacour	*Technical Adviser*
Millward W. Heath	*Supt., Construction & Maintenance*
Donald Marcy	*Associate, Educational Activities*
C. J. McGahey	*Comptroller*
John Tee-Van	*Executive Secretary*

ZOOLOGICAL PARK

W. Reid Blair	*Director Emeritus*
William Beebe	*Honorary Curator, Birds*
Lee S. Crandall	*Curator, Birds*
Leonard J. Goss	*Veterinarian*
Claude W. Leister	*Curator, Mammals*
Harry C. Raven	*Associate in Anatomy*

AQUARIUM STAFF AT ZOOLOGICAL PARK

Charles H. Townsend	*Director Emeritus*
Charles M. Breder, Jr.	*Director*
Christopher W. Coates	*Aquarist*
Ross F. Nigrelli	*Pathologist*
George M. Smith	*Research Associate in Pathology*
Homer W. Smith	*Research Associate in Physiology*
Myron Gordon	*Research Associate in Genetics*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*

Jocelyn Crane	*Research Zoologist*
Henry Fleming	*Entomologist*
George Swanson	*Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE
NEW YORK ZOOLOGICAL SOCIETY

VOL. XLV OCTOBER 1, 1942 No. 5

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York, N. Y. Title registered with United States Patent Office.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

The Lesson Not Yet Learned

What man has learned of nature he has not taken to his heart. Nature knows nothing comparable to war's destruction. Her ways are more balanced. They provide no injustices so sudden or so bitter. Combat among other living things is, with rare exceptions, neither so general nor so ruthless as that in which man engages.

In the social area, the evil genii of Europe could not have spawned their totalitarian concepts had they taken into account the instincts and ways of the higher mammals. Their social schemes could apply only to fishes and insects. Mankind will not accept the principle of regressive evolution.

* * *

In time of war not only man's spirit, but all his activities, pass through the crucible. The dross is consumed — the ultimate good remains. So must we believe, else the world agony is of no avail.

It is the hour of appraisal — even of those things not directly exposed to the flame of the conflict. This war will leave its mark on most of our institutions. Some will go on to serve more richly — others wither. The Zoological Society will pass the test, no doubt. Its field is one of perpetual public interest. Its opportunities in the development of the Zoological Park, in the creation of a new Aquarium, and in education, research and conservation, are without number.

The future presents a challenge and a hope — the hope for a more general understanding of the principles which govern all living things. Spiritual influences, correct social and economic concepts, are essential, but combined with these there must be an understanding of biological principles. In the growth of this realization may the Zoological Society play its part!

Fairfield Osborn

TORTOISES

The Galápagos Islands have been considered for a great many years as a long way from anywhere; the war has drawn them closer. In connection with Dr. Townsend's query in this issue of ANIMAL KINGDOM *whether it will be possible to save the giant tortoises that are such a striking part of the fauna of those islands off the coast of Ecuador, it is interesting to read in the newspapers recently that American air bases are to be set up on certain of the islands. It is not known whether any special provisions are being made to prevent molestation of the tortoise colonies still found wild on some of the islands. If not, they should be—by a strictly enforced agreement between the American and the Ecuadorian Governments.*

●

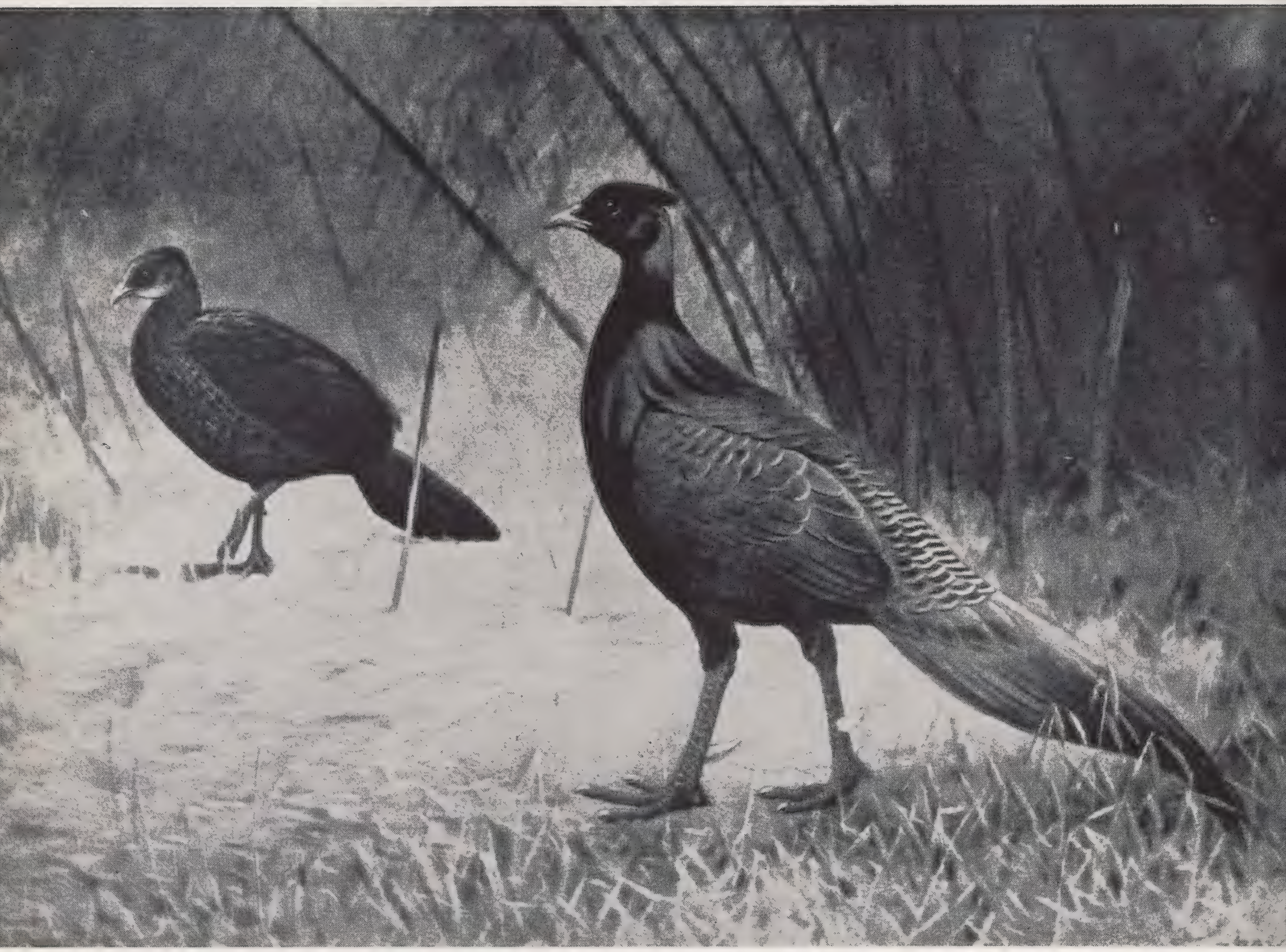
PHOTOGRAPHER

We take real pleasure in reproducing in the middle section of the magazine six photographs by David B. Eisendrath, Jr., of The Newspaper PM's Picture News. Taken in the Zoological Park, in the routine of his assignment to get good nature pictures, they show the quality of animal pictures an expert news photographer can get in the Zoo. These are among 60 prints recently exhibited at the Zoo by Mr. Eisendrath.

IN THIS ISSUE

Wapiti Bulls in the Zoological Park . . . . COVER
Fifteen Years with Indo-Chinese Birds. II. . . . . *Jean Delacour* 107
Can We Save the Giant Tortoise? . . . . *Charles H. Townsend* 109
The Story Behind a Memorandum . . . . *William Bridges* 112
Zoo Assignment: Pictures . . . . *David B. Eisendrath, Jr.* 115
How Are the Giant Pandas? . . . . *Leonard J. Goss* 120
Behind the Scenes: News and Notes 123

OCT 1942



The rarest game birds in the world are the Imperial Pheasants which Captain Delacour brought back from Indo-China in 1924. From that original pair are descended the specimens now in the United States, England, Italy and Japan. This reproduction of a painting of the birds shows the cock in the foreground, and the inconspicuous grayish-reddish hen.

Fifteen Years with Indo-Chinese Birds. II.

The Rarest Pheasant in the World Is the Imperial, and All Captive Specimens Are Derived from Two Brought Out in 1924

JEAN DELACOUR

TO ANY NATURALIST who is at the same time a field collector, there is nothing more exciting than the discovery of new species. From the start I was extraordinarily lucky in Indo-China, as one of the first new birds which came my way was the dark blue Imperial Pheasant, as I called it later, one of the most striking ornithological finds of the last twenty years and to this very day the rarest game bird in existence.

Curiously enough, I came across it without the slightest trouble, just by chance, while so many other novelties are so hard to obtain.

In the Nineteen-Twenties, Indo-China was the last large country still almost unknown, zoologically speaking, and many striking new forms of animal life could reasonably be expected to live hidden in its jungles. I had the unusual luck in the course of my seven expeditions (1924-1939) to collect and describe hundreds of new forms of birds, mammals and other vertebrates – a feat which can never be repeated, I fear. But, nevertheless, few of my subsequent discoveries were more interesting than that of the Imperial Pheasant.

Up to 1924 the rarest known pheasant was probably the small, bright blue Edwards' from Annam (central Indo-China). It was then one of the main objects of my investigation. The only four specimens known were deposited in the Paris Museum. For many years I had admired and envied these lovely birds – small and elegant, dressed in silky dark blue with metallic green markings on the wings, a small white crest and bright crimson face and legs. The hen is crestless and a uniform brown. Would it be possible to find more specimens, or perhaps even to bring them out alive and propagate them in pheasantries?

The four Paris Museum specimens, like some other great rarities, had been sent from Quangtri, central Annam, by the Rev. Father Renauld, and had been described by Oustalet in 1896. Since then nothing more had been heard of the species.

As soon as I arrived at Quangtri I found that the hill natives had already brought several Edwards' Pheasants to the aviaries of M. P. Jabouille, my host and friend, then the Resident of the Province, and during the following months more than thirty others were captured. To cut a long story short, I brought home, in May of 1924, twenty-two living specimens. They successfully bred at Clères the following year, became thoroughly established and were eventually distributed all over the world. Today Edwards' Pheasant is found in fair numbers in many pheasantries in America and elsewhere. Being a rare bird in its native forests, it is quite possible that more of them live at present in captivity than at liberty.

Several missionaries living deep in the jungle had been helping us collect and in particular the Rev. Father Meaunier had sent us a pair of birds from the Donghoi Province which borders Quangtri on the north. He thought he had secured Edwards' Pheasants, but when they arrived I realized at once that they belonged to a different, entirely new, species. The cock was blue all over, with a blue-black crest, while the hen was decidedly grayish and reddish in color,

---

The first article on Captain Delacour's experiences with Indo-Chinese birds was published in the *Bulletin* in the November-December, 1941, issue.

OCT [illegible]

both sexes being of a much larger size than the Edwards'.

Father Meaunier was living in a very remote and wild district. He sent us two more pheasants, which unfortunately died on the way, and he could do nothing more, for the bird is extremely scarce in the jungle. We had to be content with the first pair.

I long hesitated; should I sacrifice the living birds and preserve the skins of two such valuable specimens, the types of a striking new species? Acting strictly as a naturalist, I should have done so. But I never had the heart to do it! I resolved to try to bring them out alive.

Each of my pheasants had been caged in a separate compartment of long crates made by Annamite carpenters, from my own plans. Oriental workmen are very able but what they make, while quite attractive, is too often flimsy and easily broken. The doors of the crates soon became dangerously loose. However, all was well when we loaded them at Tourane. Two days later we were entering the harbor at Saigon when suddenly the door of the compartment containing the precious hen Imperial Pheasant broke open and the bird – still quite wild – bolted out. I nearly fainted as I watched the bird fly straight into a dock through a wide-open double door. My feelings for the next few minutes can only be imagined, until the bird was cornered on the dock and safely locked up again.

The rest of the journey home was uneventful. In June the birds were comfortably installed in one of my best flights at Clères and, despite their struggling protests, examined, measured and described as *Hierophasis imperialis* in honor of H. M. Khai-Dinh, the late Emperor of Annam who had taken great interest in my researches.

In 1925 both Edwards' and Imperial Pheasants bred successfully in my aviaries, the eggs and chicks of both species being seen for the first time. The incubation period of Edwards' Pheasant was found to be 21 days, while young cocks of that species take their blue livery at the age of six months. Imperial eggs, on the other hand, took 25 days to hatch out – like the eggs of other Kaleege Pheasants to which they are related. The young cocks remain brown until they reach their second year. Such important biological differences were quite unforeseen. They indicate that the two birds, although they resemble one another a great deal and live in adjacent territories, are not nearly as closely related as they look.

The pair of Imperial Pheasants lived long at Clères and produced numerous offspring. I was able to present specimens to the chief natural history museums of Europe and America and to distribute living birds widely. All the specimens in three different collections in the United States, two in England, one in Italy and one in Japan, are descended from the original birds. There were three adult pairs and four chicks at Clères in June of 1940. I dread to think of what happened to them. Among them was the old, original cock caught sixteen years before in the Quangtri mountains, still in perfect health and feather – the living type of the species. The hen Imperial had died a few years before and is preserved at the Paris Museum.

I was right in not making skins of these first specimens. On subsequent trips to Indo-China I never could obtain more of them. In 1926 and 1927 Father Meaunier secured three more Imperial Pheasants but he was never able to send them to us alive. Then the dear missionary died of exhaustion in his unhealthy post, which was thereupon abandoned. In 1938 I sent Charles Cordier to the district, but even this remarkable collector could not find any Imperial Pheasants. Thus they remain, still, the rarest pheasants in the world.

In 1928 the Zoological Society sent Dr. Townsend to the Galapagos Islands to collect a breeding stock of Giant Tortoises, in the hope they could be propagated in the southern part of the United States. These are some of the young specimens collected on that trip — the tortoises to which Dr. Townsend refers in this article.

Can We Save the Giant Tortoise?

Already Scarce in the Galápagos Islands, They Are Not Responding Well to Attempts to Hatch and Rear Them Elsewhere

CHARLES H. TOWNSEND

THE EXPLANATION of the amazing numbers of giant tortoises found in the Galápagos Islands at the time of their discovery is to be found in the simple fact of absence of enemies of the young tortoises. Until man introduced predators, there were no mammals on the islands larger than bats, and only a few reptiles, of insignificant size. The two Galápagos iguanas, of fair size, fed on vegetation.

But the early settlers from Ecuador brought with them hogs, dogs, cats and rats and these animals became the predators now on the islands.

Then sperm whalers entered the Pacific Ocean, and for more than a hundred years they made frequent calls at the Galápagos Islands to get meat — tortoise meat. The resulting strain on the tortoise stock was very heavy. Today the giants are extinct on most of the dozen large islands and the introduced predators have grown more and more abundant. Packs of dogs even pull down the calves of cattle that range the more grassy sections.

A good many years ago the New York Zoological Society undertook breeding experiments with Galápagos tortoises in our southern states. These experiments have not been successful. Eggs deposited in our comparatively cold soil fail to hatch.

Attempts have been made at Miami, Florida, to hatch the eggs in protected tubs of dry sand. Two eggs hatched in 1940 and the young tortoises were kept indoors during chilly weather; now the young tortoises are nearly two years old. That experiment was encouraging and it was repeated in 1941, but no eggs hatched.

In Bermuda, where conditions are somewhat different, the eggs were not removed from the ground, with the result that five young tortoises were hatched in two years.

Incidentally, the eggs deposited in Bermuda hatched in four months, while those in Miami required five months. We have no information on the hatching period on the Equator.

Warmth is of great importance in hatching and rearing young tortoises and by the sale of two tortoises from the colony at San Diego, California, I have been able to build at Miami a structure warm enough to insure the safety of the colony there. Such protection would not be necessary if they were located a hundred miles further south, but a remove is not practicable.

Actually, young giant tortoises have other hazards besides weather. The young are hatched with the yolk sac attached to the middle of the lower shell, which impedes their movements for some days, or so overbalances them that they are often found upside down. With such a handicap, the tender and helpless young are altogether unlikely to escape predators.

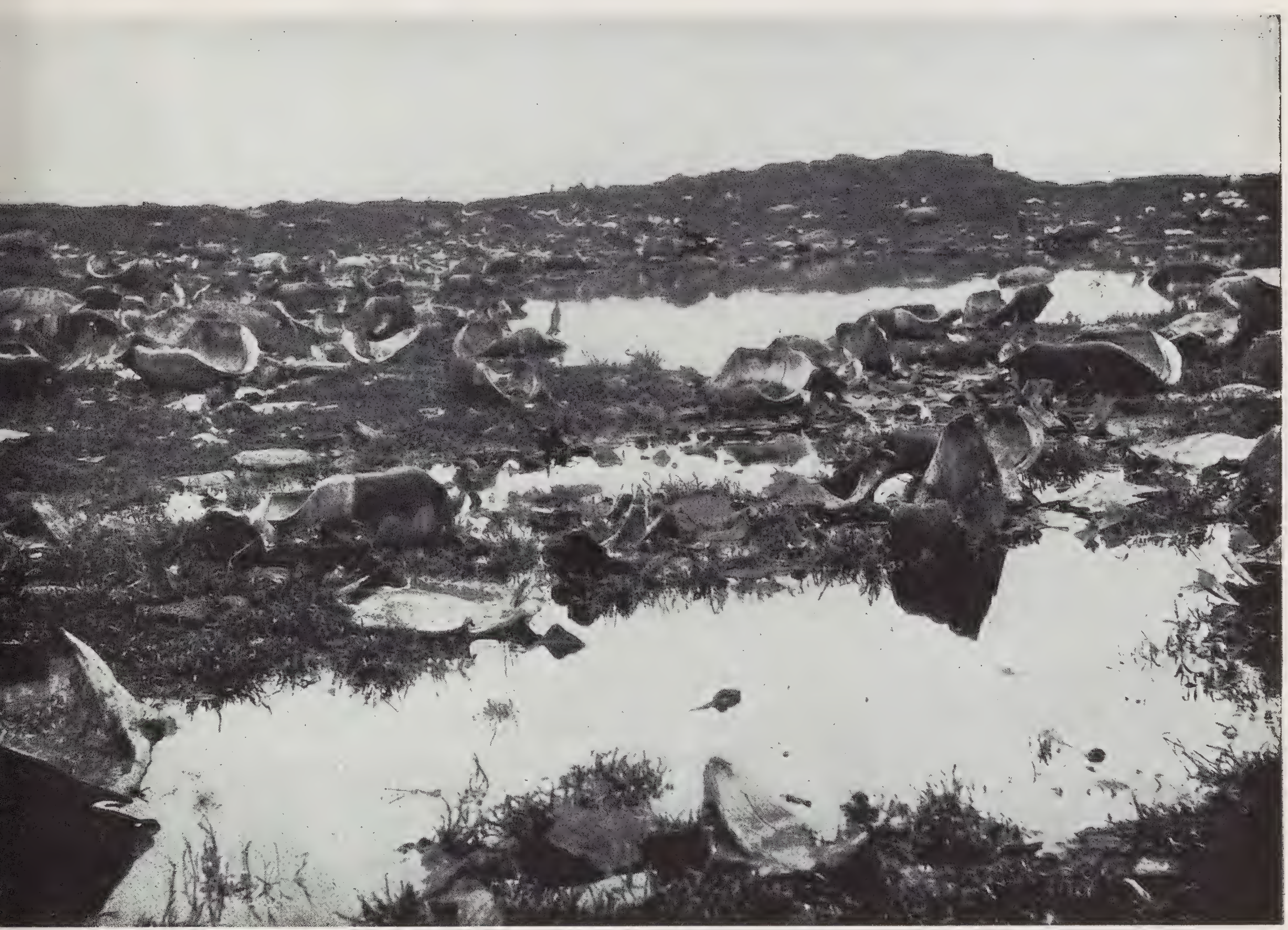
One of our colonies, of three tortoises, is living on Lignum Vitae Island sixty miles south of Miami, under natural conditions. There is, of course, little hope that their young will escape the numerous predators living along the Florida keys. Moreover, they enter salt water to avoid mosquitoes, and this has several times resulted in their being carried away by the tides.

It may seem strange that a shell-protected creature such as a tortoise can be seriously annoyed by mosquitoes, but such is the case. The insects attack the white growth ring that forms around each growth plate annually or perhaps oftener, and the tortoises apparently find that the water is their only refuge.

The hurricane of 1936 which destroyed many human lives on Metacumbe Island did not oversweep the higher island of Lignum Vitae, but two large tortoises that happened to be on the beach were washed to Cape Sable, 40 miles away, where one was killed and eaten by Negroes. The other is now with the colony at Miami. Even Lignum Vitae's forests were laid low, and there is no other island in the keys as high and thus safe from oversweeping hurricane waters. Its stout wire fences, necessary to control the colony, were destroyed in 1936.

As an example of what can happen even when precautions are taken, a tortoise one year old which I placed in a deep box was lost by the

A newly hatched Galapagos Tortoise poses between two eggs from which it was hoped that additional baby giants would hatch. This picture was taken at Miami, Florida, in 1940, when attempts were made to hatch Galapagos Tortoise eggs in protected tubs of dry sand. Only two babies were reared, however, and none came out in 1941.



Whalers looking for meat and oil-hunters seeking the fat of the Giant Tortoises virtually exterminated the great reptiles on several islands in the Galapagos group. This picture shows the site of an oil-hunter's camp on Albemarle Island. It was taken by R. H. Beck during a scientific expendition to the Galapagos in 1905 and 1906.

attack of rats, which ate the flesh from parts of the legs that could not be drawn under the protecting shell.

On the whole, I see little hope of saving the giant tortoise of the Galápagos unless the eggs can be hatched and the young thoroughly protected during their infancy.

Such protection apparently has been afforded on the Seychelles, north of Madagascar, to which many giant tortoises of the species peculiar to the islands of the Indian Ocean were removed from Aldabra Island. It is reported that many of the animals are kept by farmers of the Seychelles.

It would be a great loss if such a unique and interesting animal as the Galápagos giant tortoise were allowed to become extinct. We know that it inhabited what is now the United States during Pliocene times when the climate was very different from what it is now. I know of only two fossil specimens to substantiate this fact. One found near Espanola, New Mexico, weighed 500 pounds; the other, weighing 400 pounds, was found near Melbourne, Florida.[1]

Giant tortoises could never have been abundant on the continent or naturalists would have found more numerous remains between here and the Equator — they have found none at all in Central America or South America, to my knowledge. So far the presence of the living animals only on the Galápagos Islands, 500 miles off the coast of Ecuador, has not been explained.

---

[1] *National Geographic Magazine,* February, 1942, Page 184.

In the waters alongside the dock at the Palmetto Key laboratory of the Aquarium there were countless needlefish — and at one time or another most of them were seined up and examined for eggs. No fully ripe female was ever found here, however. The eggs that are the basis of this article were taken at Useppa Flats half a mile away.

The Story Behind a Memorandum

Dr. Breder's Return from Florida Was Delayed and the Reason Will Appear Eventually in a Paper in Zoologica

WILLIAM BRIDGES

THIS IS A STORY about patience and perseverance, mostly, and almost incidentally about a dozen hairy eggs of *Strongylura notata.*

Results in science are seldom attained with dramatic suddenness; usually they are the products of slow and painful steps. Patience and perseverance are therefore the primary tools of the men who work with raw nature, and there is nothing exceptional in this little account of how the needlefish eggs were found and how their embryonic development was recorded. Only, such stories seldom get told. The men who create the stories forget to tell them.

This one, like many another, would have been forgotten if I had not come across a memorandum, now more than a year old, explaining why Dr. Charles M. Breder, Jr., would be a few days late coming back from the Aquarium's field station at Palmetto Key, Florida. He had written that "just as I was preparing to leave, I got the first real break of the trip in the form of the eggs of *Strongylura notata,* and it is just too good to drop for the matter of a few days."

Reminded of the memorandum, Dr. Breder was willing to tell the tale that lies behind it, and even to produce a folder of sketches and field notes. Little of the latter material can be used here, however, for it is the skeletal stuff of a detailed paper that will be published in *Zoologica* next year—or as soon as Dr. Breder finds the time to write it. Patience, it seems, is still needed at the end of a twelve-year search.

The beginning of the search for eggs of the southern needlefish goes back to 1929 when Dr. Breder was working in the Dry Tortugas under a grant from the Carnegie Institute. For more years than he likes to remember, he has been amassing data for a monograph on the reproduction of fishes and in 1929 he managed to record a few notes on the needlefish. He even had a collection of eggs, but they could not be fertilized.

The prospect of continuing the work on needlefish appeared brighter in 1938 when the Aquarium's field station was opened at Palmetto Key, for *Strongylura notata* is abundant in that neighborhood — as it is, indeed, from North Carolina to the West Indies and a drag of the seine off the laboratory dock would bring up a dozen to fifty of the slender, long-beaked, 10- to 14-inch fishes at a time.

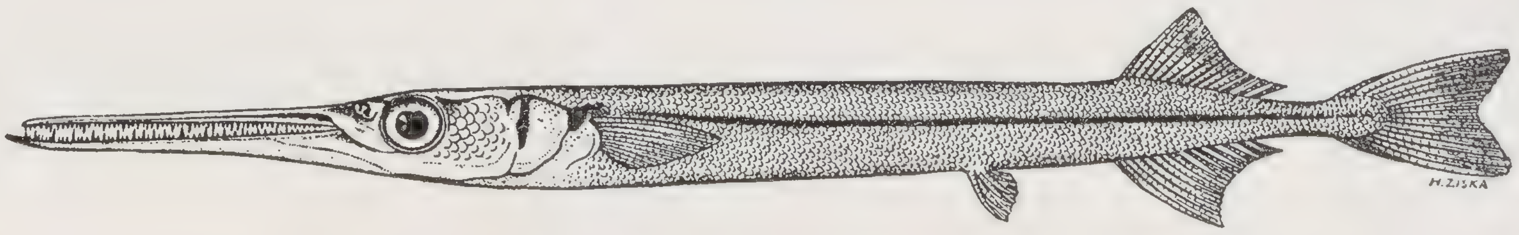
Between 1938 and the afternoon of July 5, 1941, literally thousands of needlefish were seined up along Palmetto Key, examined for eggs, and tossed back into the Gulf of Mexico. For some reason that is not entirely clear, fully "ripe" female needlefish simply are not found around Palmetto Key — at least during the summer, and occasionally mid-winter, months when an Aquarium staff has been working at the field station, although all large enough are nearly ripe or are spent. Dr. Breder thinks it likely that needlefish spawn through a comparatively long season and that the females come into ripeness one by one, at different times, instead of in vast numbers, all at about the same time, as is common with many fish.

On July 5 of last year the Aquarium staff — Dr. Breder, Dr. Richard T. Cox of New York University and Ben Dontzin, a student of Cornell University — was preparing to close up the field station and return to New York. By noon most of the heavy packing was finished and Dr. Breder elected to spend the afternoon in the laboratory gathering up the odds and ends of notebooks, small nets, specimen bottles and so on that had accumulated during a month's work. It was a one-man job, and Ben Dontzin persuaded Dr. Cox to act as a seining partner and announced that he was going to make one last try for ripe needlefish. Virtually every specimen around the laboratory dock had been seined up and tossed back a dozen times during the summer, for Dontzin was enthusiastic about the needlefish project, and even the fishes that fed offshore from Useppa flats half a mile away were hardly less accustomed to periodic examinations. But Dontzin and Cox decided to give the Useppa shallows another, final, going-over on this last afternoon.

"Along about four o'clock I heard our motorboat come roaring in," Dr. Breder said. "Dontzin was yelling and waving his arms and he came running up to the laboratory before the boat was tied up. He had a laboratory 'fingerbowl' half full of sea water — and in it was a cluster of about two dozen little globules of jelly, with hair-like projections. They were the eggs of *Strongylura notata,* the needlefish, and Dontzin was as excited as if he had laid the eggs himself."

By the time the motorboat reached the laboratory dock, the development of the fertilized eggs had already started and when Dr. Breder got them under a microscope, scarcely half an hour after they had been taken from the female fish, cleavage was under way and the eggs had reached the 8-cell stage.

While Dr. Breder, one eye at the microscope, drew rough sketches of the eggs and took notes on development, Dontzin and Dr. Cox told how they got the eggs.



The needlefish is aptly named, for its sharp, pointed beak accounts for about one-fourth the length of the 10- to 14-inch fish. The southern form found at Palmetto Key is yellow-greenish above, with a silver belly and a black lateral stripe. Females are larger and fatter than the males.

They landed on Useppa flats shortly after noon, they said, and immediately began seining the shallow water along shore. Every sweep of the 50-foot seine brought in hosts of needlefish, along with miscellaneous small fry, and they went over the needlefish methodically to pick out the females – easily distinguished from the males by being larger and fatter. They examined scores of females, but none of them were carrying ripe eggs.

And then a sweep of the seine brought in a peck of needlefish and one female was ripe. Just ready to spawn, probably that same afternoon.

It took but a moment to press the eggs into a bowl of sea water, fertilize them with milt pressed from a male caught in the same net haul, and then the seine was jumbled into the motorboat and the two fishermen shot back across the bay to the laboratory dock.

Dr. Breder shared their enthusiasm, but he wished heartily that that female needlefish had timed her eggs a week sooner. All plans were laid for the field station staff to start north the next morning and while it would be possible to hold up departure a few days, the rate of development that revealed itself under the microscope that afternoon and evening indicated that *Strongylura* had an extraordinarily long developmental period and it was going to take quite a number of days – possibly a week or more – for the embryos to reach the point of hatching.

"You can tell almost right away after an egg has been fertilized, approximately how long it will take for the embryo to develop," Dr. Breder explained. "With most fishes it is very fast – the whole thing is over in forty-eight hours or so. When I saw how these needlefish eggs were going, I knew it would take a great deal longer than that, but I didn't have any idea it would take as long as it did.

"I wanted to be back in New York by July 10, and I had to be there by the 13th or 14th at the latest, and so it was then that I wrote to the Aquarium and explained what had happened, and why I would be a few days late getting back home.

"So we unpacked the equipment we had to have, and settled down at the laboratory for a steady session of observation. Every few hours, at suitable intervals night or day, I would put an egg under the microscope and when the embryo had reached a significant stage of development, make sketches and notes of the time it took and its position in the egg and so on."

That sort of routine went on for four days and on the night of July 9 Dr. Breder reluctantly admitted that there was nothing else to do – he would have to start back to New York the next day and follow the development of the needlefish embryo as best he could en route.

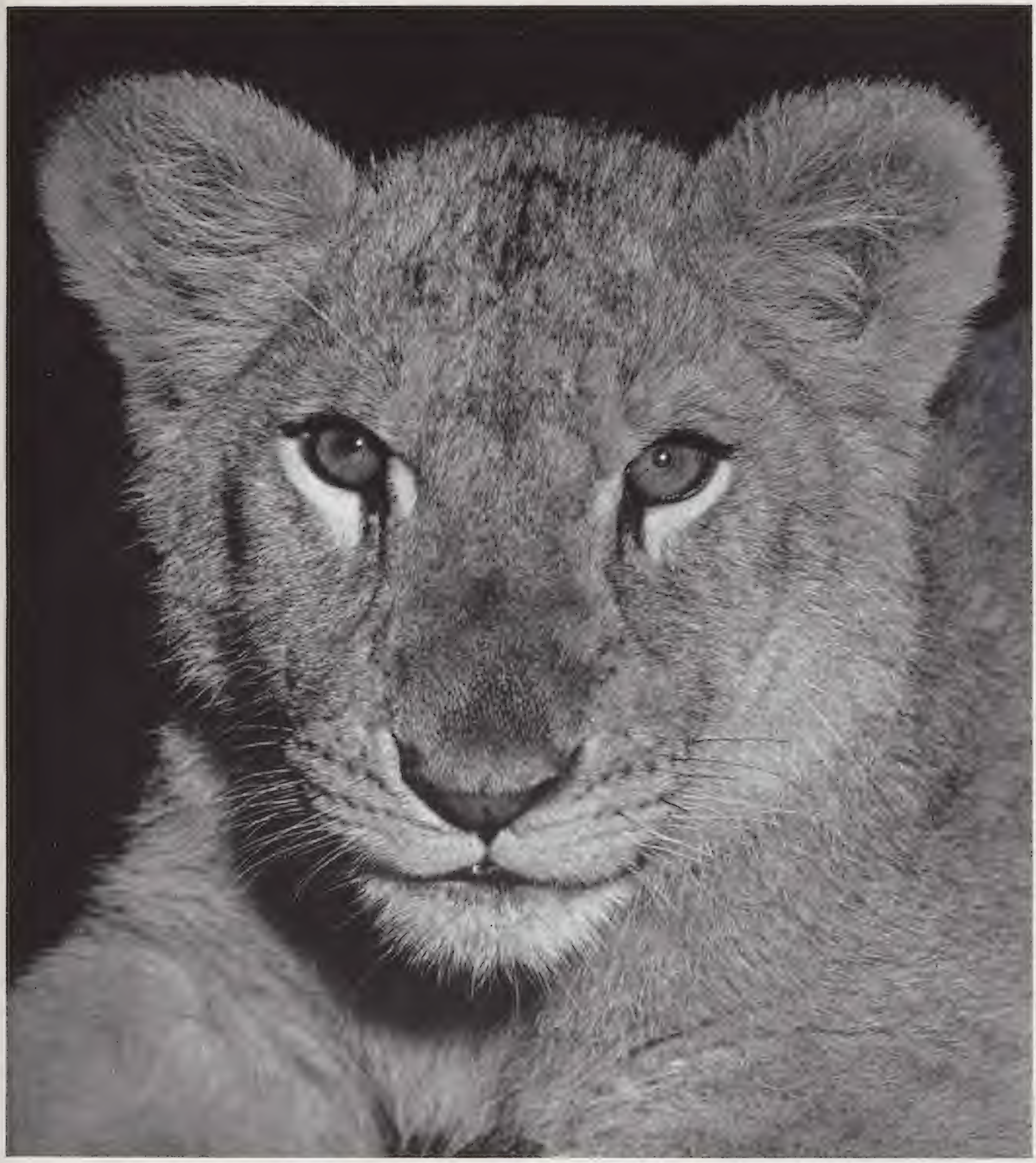
It was not a happy prospect – a trip of 1,400 miles north by automobile, in a car that had to carry Dr. and Mrs. Breder, Dr. Cox and Mr. Dontzin and a mountainous pile of fragile equipment. The discomfort of the trip was something that had to be accepted whether the needlefish eggs went along or not, but the really difficult thing was to maintain the eggs at a constant temperature during the three or four days of the journey.

Sea temperatures around Palmetto Key, it seems, are unusually high, ranging from about 85 to 93 degrees Fahrenheit in summer. In such an environment the eggs of the needlefish would normally develop, and Dr. Breder decided that the safest temperature variation for the eggs on the way home was between a minimum of 85 and a maximum of 90 degrees. The maintenance of these limits had to be watched even in the field station laboratory, for, strangely, the air temperatures at Palmetto Key are generally cooler than those of the sea water, but with laboratory equipment at his command he managed to keep the eggs warm enough from July 5 to the morning of July 10 when the staff started home.

With Mrs. Breder at the wheel, Dr. Cox and Mr. Dontzin wedged into the back seat among sharp-cornered boxes of bottles, and Dr. Breder on the front seat with the needlefish eggs in a Mason jar between his knees, the northward journey began.

On the seat beside him, and in odd corners among the rest of the baggage, he carried additional Mason jars of filtered sea water as replacement for the water surrounding the precious eggs – now, incidentally, reduced to about a dozen because of the usual losses incident to infertility and the preservation of some in particular stages.

Every ten minutes, as the automobile rushed through Florida, Dr. Breder inserted a thermom-

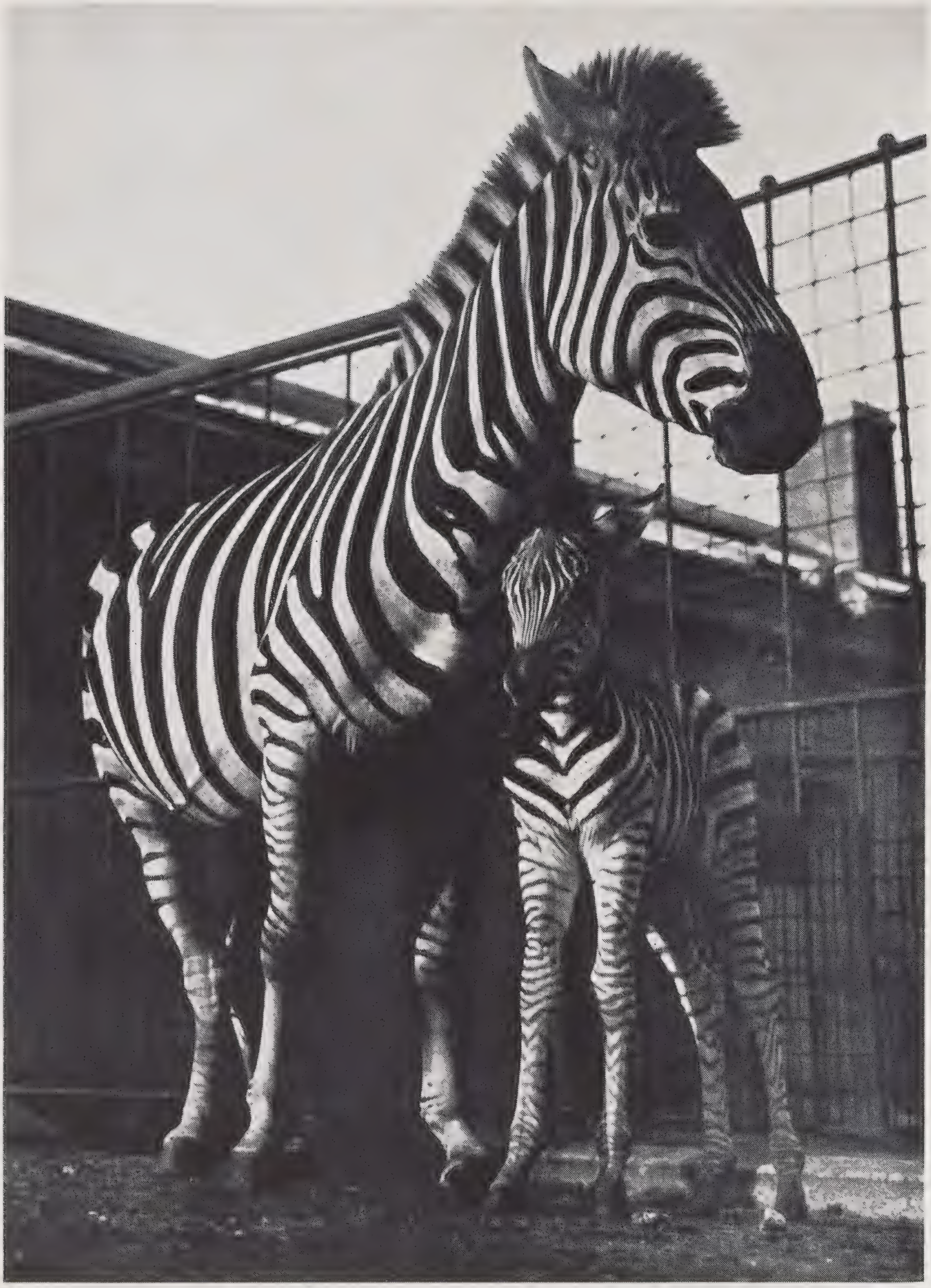


NIKI: PORTRAIT OF A LIONESS CUB

ZOO ASSIGNMENT

The pictures on this and the three following pages were taken at the New York Zoological Park by David B. Eisendrath, Jr., of The Newspaper PM's Picture News, in the course of his regular assignment to get animal pictures. These and about sixty other outstanding animal photographs by Mr. Eisendrath were exhibited at the Heads and Horns Museum Gallery in the Zoological Park during the summer. For the sake of camera enthusiasts who may wish they could take such fine animal pictures, the technical data on each picture is offered by the photographer.

Made with 4x5 Speed Graphic, 8¼″ Plaubel Anti-Comar lens, f 22, 1/200 sec., Super Panchro Press Type B film, 1 flashbulb.

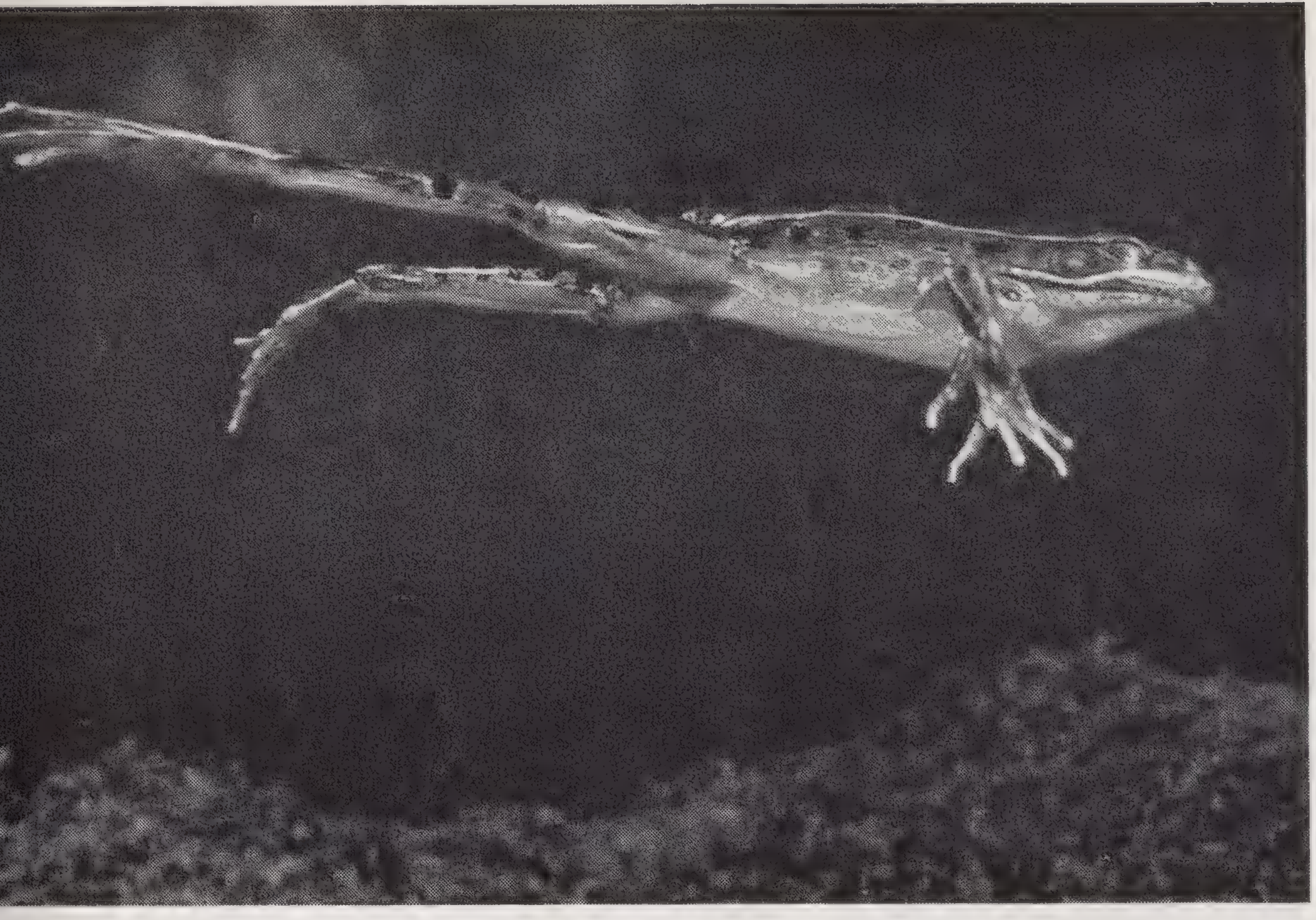


MOTHER AND SON

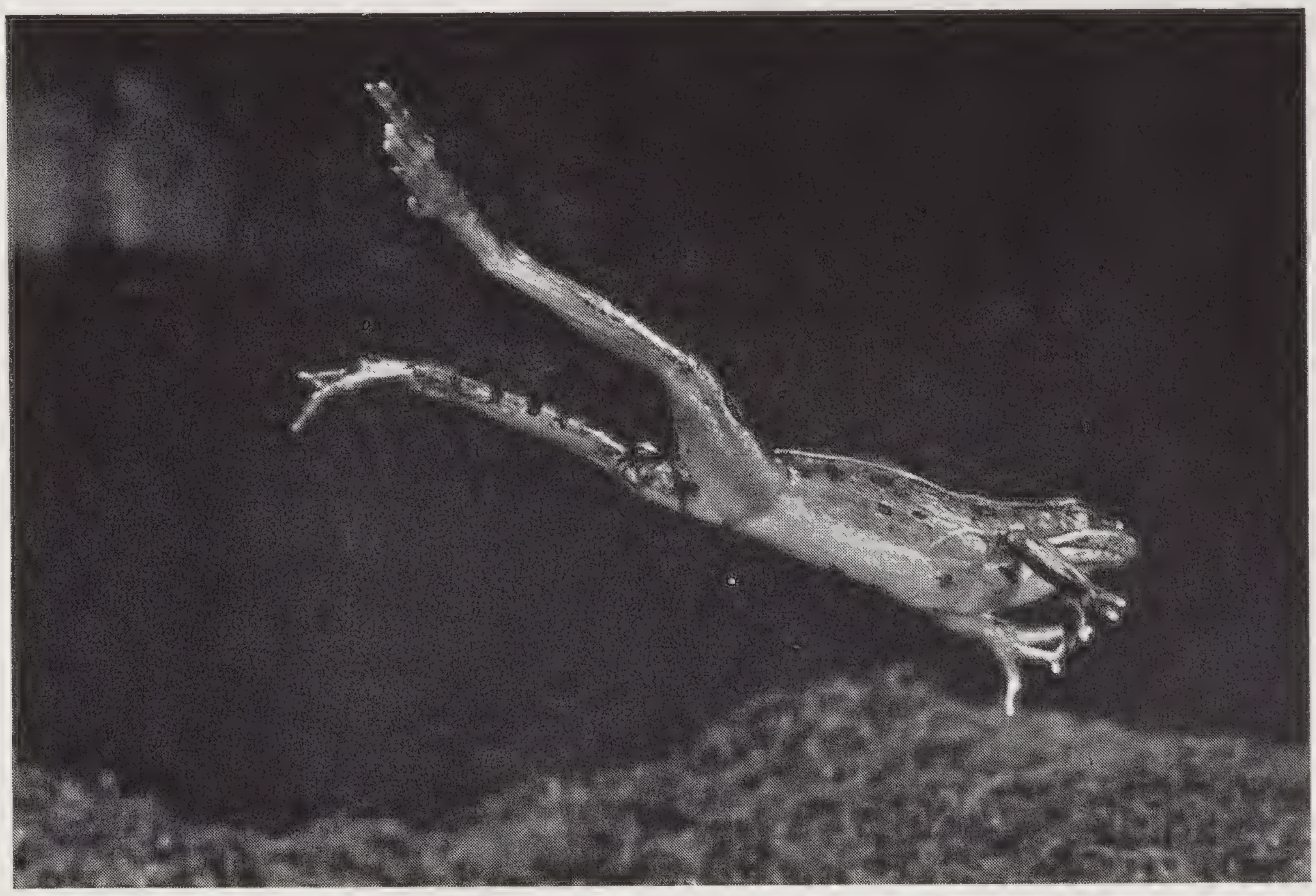
Made with 4x5 Speed Graphic, Zeiss Tessar lens, f 8, 1/235th sec., Super XX film.

HAPPY LANDING!

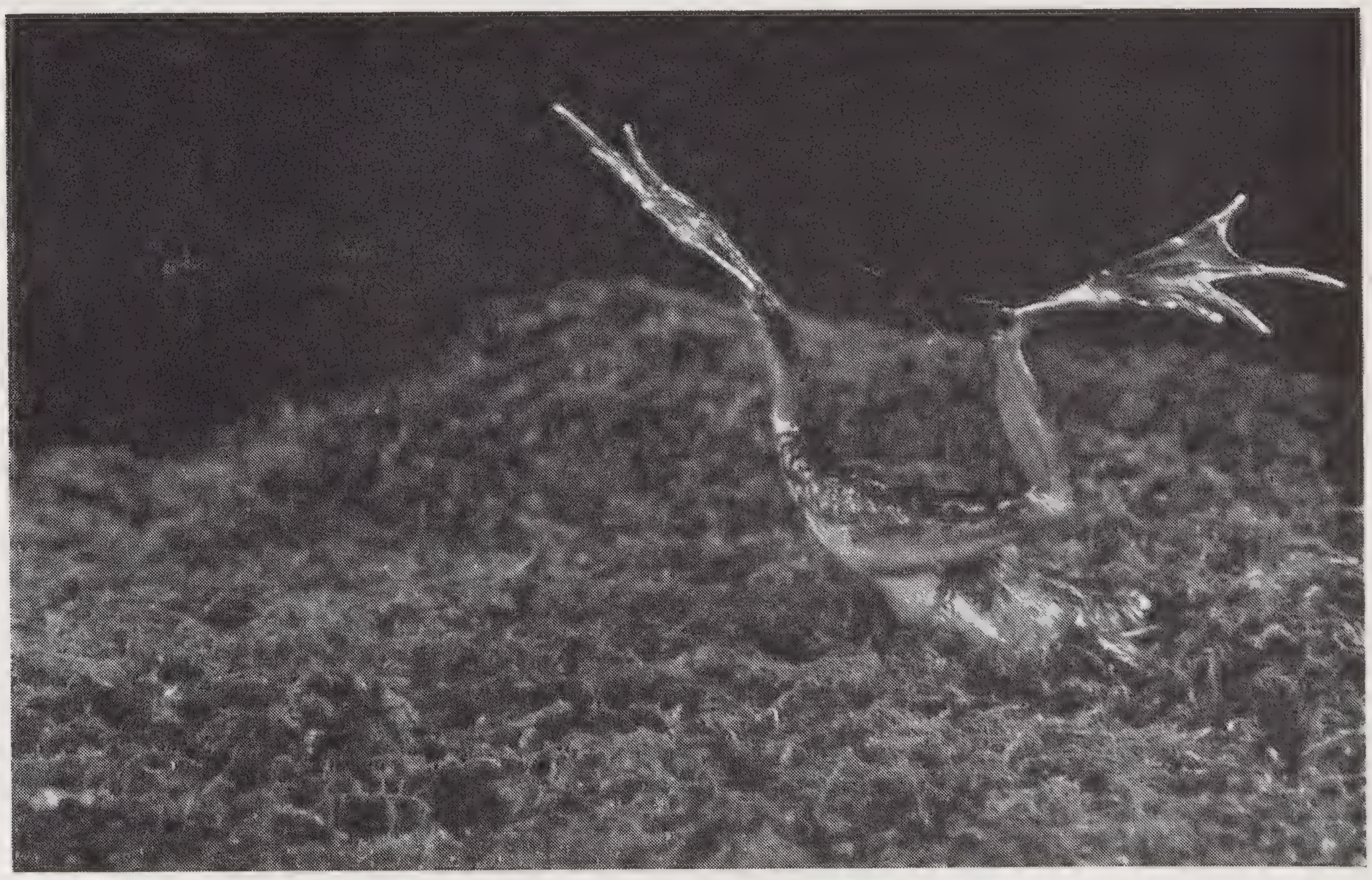
These pictures made with stroboscopic equipment to show how a Leopard Frog jumps. Made with 4x5 Speed Graphic, 5¼" Zeiss Tessar lens, f 22, 1/30,000th sec., Super XX film.



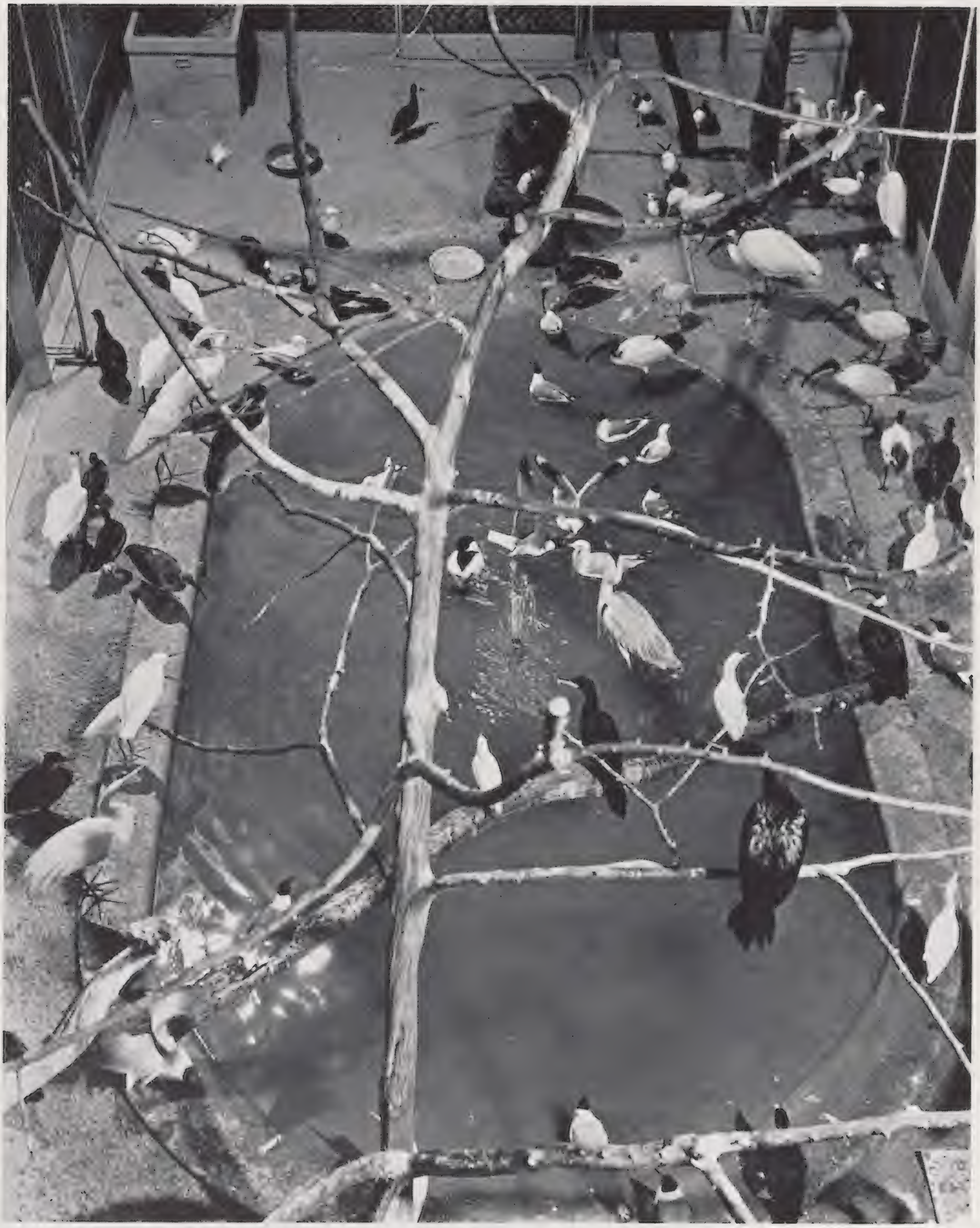
I



II



II



AQUATIC FLIGHT CAGE

Made with 4x5 Speed Graphic, 5¼″ Zeiss Tessar lens, f 22, 1/100th sec., Super Panchro Press Type B film, 3 large flash-bulbs.

eter in the Mason jar. If the water temperature was approaching 90 degrees – as it generally was, for the weather was extremely hot – he soaked a towel in water, wrapped it around the jar, and held it out of the window to cool by evaporation.

"The weather was so hot, and I was so busy changing towels every few minutes, that I haven't the slightest recollection of the scenery," Dr. Breder said. "We ate on the run, because the water would rush toward 90 degrees every time we stopped to refuel or get lunch, and we had to keep moving so the air would cool it down."

On the morning of July 10 Dr. Breder had made a sketch at the laboratory; at that time the embryo needlefish's circulatory system had developed, the heart was beating and blood was flowing through the minute organism. The details of this stage were recorded that night in a hotel room in Palatka, Florida.

"I thought we were going to lose the eggs that night," Dr. Breder admitted. "The temperature was around a hundred when we got into Palatka and while I had the jar pretty well under control as long as we were driving, I knew there would be trouble as soon as we went into a stuffy hotel room.

"When we drove up to the hotel, I got hold of a bellboy and ordered a bowl of cracked ice even before our bags were carried in. While the rest of them were registering, I went upstairs with the ice and gave the Mason jar a cold bath, and pulled its temperature down.

"The microscope and my notebook were packed on top of everything else, so I could get them quickly, and I rigged up a desk lamp and went to work, sketching and taking notes until midnight. By that time the room was a little cooler and I could let the eggs stand in safety, but I got up at 4 o'clock and started sketching again, because by this time the development was coming along rapidly and there was a lot to be done."

The next day, July 11, saw the party on its way to Sumpter, South Carolina, but the heat had moderated and there was no need to call for ice cubes.

The sketches made at Sumpter show that the embryo's gills were active and fluttering.

Trouble of a different kind struck the next day, July 12. Outside of Fredericksburg, Virginia, the automobile ran through a violent thunderstorm which brought the temperature tumbling to 70 degrees. Dr. Breder's automobile was equipped with a temperature control mechanism that brings the heat up to a pre-determined level – although it does not keep the car at a cooler level during hot weather – and it was necessary only to close the windows, set the thermostat at 85 degrees, and enjoy the certainty that the fish eggs were comfortable. That was far more than could be said for the human occupants of the car, however. They were pretty well cooked by the time they reached Fredericksburg.

The temperature of the hotel room was a cool 70 degrees – 15 to 20 degrees below the safe range of the eggs. For a time Dr. Breder thought it might be necessary to spend the night in the hotel's kitchen, near the stoves, but after thrusting a thermometer in all corners of the room and moving a table to the warmest one, he wrapped his Mason jar in dry towels and stowed it away in a drawer. Sea water loses its heat comparatively slowly and although Dr. Breder had to get up at intervals all through the night to take precautionary thermometer readings, the jar never fell below 85 degrees.

That night's sketches advanced the development of the embryo significantly. The iris of the eye was becoming silvery and the long beak of the baby fish was beginning to form.

More eggs had died, too; now there were only five still alive and developing.

July 13 brought the journey to its conclusion. Just before dark Dr. Breder drove up to his home at Mahwah, New Jersey, and while Mrs. Breder struggled with the unpacking of the Florida baggage, he transferred the eggs to his own laboratory jars and set up his microscope. By this time the yolk that feeds the developing embryo was shrinking rapidly, the iris was fully pigmented, and the beak was almost as long as it was to be in the newly hatched fish. Obviously the embryonic development was nearly complete.

For three more days Dr. Breder guarded his precious eggs, staving off the appointments that demanded his presence in New York City. One more egg died, then another. Still development went on, minutely, each climactic change demanding careful observation, sketches and notes.

On the afternoon of July 16, just twelve days from the time the eggs were fertilized in Florida, Dr. Breder called the story finished. There were only three eggs left alive. By this time he knew they were certain to break their transparent covering and emerge as baby needlefishes within a few hours. He wanted them intact at this final stage for future study purposes, and so he dipped the shining globules out of their sea water home and dropped them into 10 per cent. formalin.

"There's nothing to the story, really," Dr. Breder protested at the end. "The work itself was interesting, but routine. The trouble we went through was a little more than usual – I'm glad to say – but it was well worth it. Now we've got the embryological development of this species, and it's waiting to be compared with the other data on the Synentognath fishes. When it's published, we'll have a little better understanding of the relationships within that group. That's all."

How Are the Giant Pandas?

So Many Visitors Ask Questions About Them that the Zoological Park's Veterinarian Gives a Report

LEONARD J. GOSS

How large do they grow? What do they eat? How old do they get? Do they really live on bamboo? These and other frequently asked questions prompt us to give our formula for feeding the baby Giant Pandas.

When the babies came on December 30, 1941, they were at first fed the same as during their trip. Although it was felt that they could do well with more feed, we preferred not to make any changes in their diet or feeding routine until they became adjusted to their new home and climate.

From the time of their capture in China, they had been fed a gruel of cooked cornmeal, a prepared baby cereal food, evaporated milk, honey and water. In addition, they received all the bamboo sprouts they would take. When it was felt that they were adjusted to their new environment, the porridge was altered by increasing the amount of prepared cereal food, doubling the quantity of milk, and adding vitamin concentrates. Leafy bamboo sprouts three feet long, shipped weekly from Florida, are kept before them constantly.

The vitamin concentrate is not only potent, but is very tasty – a far cry from the dreadful fish oils poured down the gullets of thousands of American babies in my youthful days. Our pandas' vitamins come in a powdered form and are mixed with their porridge. The mixture contains Vitamins A, B_1, B_2, C, and D. Each dose of two heaping teaspoons is equivalent to the Vitamin A in $\frac{2}{3}$ of a teaspoon of cod liver oil, the Vitamin B_1 in 6 slices of whole wheat bread, the Vitamin B_2 in 3 eggs, the Vitamin C in 2 oranges, and the Vitamin D in $1\frac{2}{3}$ teaspoons of cod liver oil. If vitamins are as important to health as the makers of bread, beer and the vitamins themselves would have us believe, the Park someday should be overrun with pandas of all sizes.

Although bamboo is asserted to be the sole food of pandas in the wild, captive ones both in China and the United States have been fed all kinds of foodstuffs. Most of the pandas in captivity in China are usually fed cornmeal, honey and bamboo; however, some are kept on ears of corn, pears, sugar cane, a very poor bread baked of cheap, coarse wheat flour, bran and salt. In this country, their diets have in-

No one can have any doubt about the health of the Giant Pandas when they begin to play — for it takes a robust constitution to do the things these youngsters do. The best time to see them at play is shortly after they are turned out in the morning — between 10 and 11 A.M. — and just before feeding time, about 3:30 to 4 P.M.

cluded fresh vegetables, syrup, dog biscuit, liver, fruits, eggs, corn stalks, bamboo and willow sprouts, sugar cane and a gruel similar to what we feed.

In comparing analyses of bamboo sprouts with analyses of other foods, it becomes increasingly hard to believe that pandas could subsist on bamboo sprouts alone. But it is granted that the panda is a marvelous animal in many ways, and perhaps his gastronomical mechanism is as wonderful as his many other characteristics.

From a nutritive standpoint, bamboo sprouts are similar to celery or asparagus. It would be most difficult for the finest French or Chinese chef to satisfy our food tastes and requirements on these two articles alone. The corollary of that statement probably is that we are not pandas.

The prepared cereal food has the following ingredients and analysis:

Ingredients

whole wheat meal
oatmeal
wheat germ
powdered skim (cows') milk
yellow cornmeal
brewer's yeast
barley
malt
table salt
calcium carbonate
reduced iron

Analysis	
protein	19.4%
carbohydrates	65.2%
fat	2.4%
ash (minerals)	5. %

We have a pretty definite idea of what, at any rate, the Giant Pandas do *not* include in their diet. They may prefer not to subsist on bamboo alone, or even chiefly, but they certainly pay no attention to dozens of offerings tossed to them by the thoughtless public. From the floor of the pandas' enclosure their keeper has swept such a miscellany as peanuts, popcorn, rubber balls, pocketbooks, handkerchiefs, wood, pipes, cellophane, marbles, buttons, junk jewelry, ice cream sticks, crumpled paper and bottle tops. He reports that — very fortunately, for some of those objects would certainly cause the death of the pandas if swallowed — the young animals pay no attention to the things tossed into their enclosure.

Our maestro of black and white, John Blair, keeper of the pandas and penguins, is largely responsible for the excellent condition of our two engaging Chinese ambassadors. Blair's first love was his penguins at the old Aquarium. I am sure his constant vigilance over the pandas has altered his affections. His detailed and interesting notes on the personality and physical progress of Pandee and Pandah are evidence of his fondness of them.

The female, Pandah, was the smaller and more tractable until recent months. For this reason she appeared in most of the pictures, in John Tee-Van's arms, during their trip to America. Pandee was a spunky little fellow with a mind of his own. Keeper Blair now likes the male better, because he is "easier to get along with and responds to commands." Blair says that the female is the smarter and trickier. She was the first to alarm us by sitting in the top of a tree in her enclosure for twenty-four hours, and the one that compelled us to change the shelter-house gate four times before we could successfully confine her. It was she who sat on the pandas' first birthday cake last March. But Pandee, not to be outdone by the fair sex, countered by upturning the chairs and sitting on the birthday party table. When the female squashed the cake, we interpreted it as the clever Chinese way of letting us know that even baby pandas know good panda feed from bad, and that our improvised diet was correct for them.

The pandas have repeatedly been weighed, at intervals from Chengtu to New York. At first they climbed onto the scales for their monthly weighing, but finally it became apparent that Nature did not form the posterior of pandas for sitting on scale platforms without rolling off, so now they are crated each month to be weighed.

HOW THEY HAVE GROWN

PANDAH — FEMALE

PLACE	DATE	WEIGHT
Chengtu	11/ 1/41	42 lbs.
Chungking	11/14/41	47 lbs.
Port Moresby	12/ 4/41	51 lbs.
New York City	12/30/41	57.4 lbs.
" " "	1/30/42	66.6 lbs.
" " "	3/ 2/42	78.9 lbs.
" " "	3/31/42	87.4 lbs.
" " "	6/18/42	117 lbs.
" " "	7/18/42	131 lbs.
" " "	8/18/42	148 lbs.

PANDEE — MALE

New York City	12/30/41	62.7 lbs.
" " "	1/30/42	75.9 lbs.
" " "	3/ 2/42	90.2 lbs.
" " "	3/31/42	101 lbs.
" " "	6/18/42	128 lbs.
" " "	7/18/42	142 lbs.
" " "	8/18/42	153 lbs.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

NEW STAFF MEMBERS

Two new members of the staff joined the Zoological Park in mid-September. Mr. Millward W. Heath became Superintendent of Construction and Maintenance, and Mr. Donald Marcy became associated with our educational activities.

For the past ten years Mr. Heath has been on the engineering staff of the General Electric Company, and for a number of years has instructed apprentice groups at the Mechanic's Institute in New York City. He is a graduate of the School of Engineering of Columbia University with the degrees of B.S. and E.E., holds a New York State license as a professional engineer, and is a member of Tau Beta Pi, the national honorary engineering fraternity, and of Sigma Xi, the national honorary scientific fraternity.

Mr. Marcy is a graduate of Oregon State College in 1940 with a B.S. degree, and received an M.A. degree from Columbia University in 1942. For the past two years he has been connected with the School Nature League at the American Museum of Natural History. He was also an assistant in the work of the International Game Fish Association.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Annual

Harry Eldridge
Winston Guest
Miss Laura Harding
Samuel Hand Hun
Mrs. Albert Musa
Mrs. John Avery Sanborn
Mrs. Lewis S. Thompson

Junior Member

Allen Wachtell

* * *

A young specimen of the South American Tapir (*Tapirus terrestris*) was added to the mammal collection during the late summer. This is the first specimen we have been able to exhibit in several years.

AMERICAN FLAMINGOES

It has always been a source of disappointment to the Bird Department and the public alike that various normally-red birds rapidly lose their color on exhibition here. American Flamingoes, Scarlet Ibises and Spoonbills, in particular, have grown successively paler with each of their moults until, after a year or two, they are generally pale pink or an actual white.

Recently Curator of Birds Crandall has been experimenting with a new diet for such birds, and has strong indications that he can keep them in color. There has never been any question about the health of the birds under the conditions in which they are kept and exhibited; they live long and apparently happily in the Zoological Park. But some element in their diet — for years known to affect the color of certain birds — has been lacking.

Late in August we received four fully-colored American Flamingoes as a gift of the Hialeah Racetrack at Miami, Florida. They have been placed on the new diet and we will know, after their seasonal moult next February and March, whether the diet is as effective with them as it has been with the ibises and spoonbills.

Hialeah, incidentally, is the only place in the United States that has managed to breed American Flamingoes. Attempts have been made elsewhere, but without success. The birds have their greatest natural breeding place on Andros Island in the Bahamas; they are also found in Cuba, Yucatan and possibly on the northern coast of South America.

Their diet in the wild consists of marine crustaceans chiefly; in the Zoological Park they get dried shrimp, rice, game biscuit and wheat — apparently a perfectly satisfactory substitute as far as good health is concerned. In addition, the newcomers are getting the preparation which Mr. Crandall hopes will enable them to retain their handsome red coloration.

MAMMAL DEPARTMENT NOTES

Visitors who, at feeding time, happen to be at the moated exhibit just south of the Reptile House, which this summer holds a miscellaneous collection of small mammals — including two skunks, two raccoons, a nutria, two woodchucks and a half-dozen agoutis — are sometimes surprised and amused by the actions of one of the skunks. He shows every sign of wanting to be the big boss of the enclosure.

Skunks are known to be good bluffers and most animals usually give them a wide berth so that they can go serenely on their way. Consequently, when the keeper enters the enclosure, the more ambitious of the two skunks never seems to understand why he can't chase the intruding human being right out again. He rushes up to the keeper and thumps the ground with his forelegs. In skunk language, this means: "Get going, fellow!" Getting no results from a mere warning, he decides to give the keeper the works. With a quick turn of his body, he presents his business end — up goes his tail — and nothing happens! All our skunks have been descented.

* * *

One of the best sights in the Zoological Park this fall is our herd of elk, or Wapiti; it is the finest herd we have exhibited in years.

Last year the range was newly seeded and because of the extraordinary amount of rain during the summer, the big range is unusually lush and green now.

Our herd dates back to the early days of the Park, to a magnificent bull named "Stanley." His influence is still in evidence, in the above-average size of individual animals and the fine antlers of the bulls.

Amateur photographers have always recognized the possibility of getting striking pictures of these animals, especially at this season of the year when the bulls are out of velvet and are full-antlered. At certain hours of the day the entire herd is generally found on a shady outcropping of rock that affords a commanding view of the surrounding territory. Thousands of visitors, certainly, have photographed them at rest on the ledge.

A small lake formed near the middle of the Elk Range this past summer, during the heavy rains, and the shallow pool persisted for several weeks — much to the pleasure of the wapiti, which congregated in the pond for mud baths. Years ago a series of small ponds probably extended through this section of the Park and various water birds undoubtedly haunted the area, although they disappeared when the field was drained. The temporary pond brought them back again, however. On one August morning we noted eight Lesser Yellowlegs and two Solitary Sandpipers dabbling in the shallows, and a flock of about eighty Semipalmated Sandpipers stayed on for several days. Those of us interested in birds could not help observing how remarkable it is that these migrants can so readily find such a transitory place for food and rest.—C. W. L.

THE PASSING OF BURMA

In the thirty-eight years that have passed since the Zoological Park obtained its first elephant, there have been only three or four with "personality"— Gunda, the would-be killer; Khartoum, the giant; Alice, the impetuous and loveable. And then, two years ago, we acquired little Burma. "Baby Burma" as the newspapers often called her.

Gunda and Khartoum are long-since gone, and Alice is literally on her last legs. Burma seemed likely to be Alice's successor in the affections of the staff and the public until Saturday morning, August 22, when Curator of Mammals Leister was compelled to execute her with a merciful bullet.

Four days before Burma had nearly severed her trunk. It happened late in the afternoon after she had been brought in from the children's riding track for her supper. After eating, and while the Elephant House keepers were busy attending to the wants of the other riding elephants, Burma went exploring in her stall. The heavy, iron-bound doors that lead to the outside corral had been closed and chained, but somehow Burma managed to pry one pair of doors open a few inches — enough to insert her trunk in the crack. Then, either because the door pinched her and she became frightened, or out of sheer inability to understand the workings of doors, she presumably butted the door with her head — and it closed on her trunk.

Dr. Goss was on the scene in a few minutes and did all he could to prevent infection; he took innumerable stitches and bandaged the trunk, after administering a local anaesthetic, and Burma behaved beautifully during the operation. But near the end of the week it became evident that there was no chance of the injury healing; the cut was too deep.

Without the last eighteen inches of her trunk Burma would have been completely helpless, and so the hard decision was made to end her life quickly and painlessly.

She was a gentle and affectionate elephant and although there are two other Indian elephants left to carry on the riding track routine, Burma will be sorely missed.

THE SWIFTS ARE LEAVING

At one time or another in the past forty years most of the common birds of eastern North America have been exhibited in the Zoölogical Park. But never a specimen of *Chaetura pelagica* – the Chimney Swift. How can we exhibit a bird that probably never in its whole life voluntarily touches the ground, spends every waking hour on the wing and usually demands the inside of a chimney or a hollow tree for sleeping purposes?

We never have and probably never will exhibit Chimney Swifts in cages, but they exhibit themselves to wonderful advantage about this time of the year when they are gathering in huge flocks for the beginning of their migration to their winter homes. Where those home are, nobody knows for certain, but the swifts probably speed toward the sunny skies over the great rain-forest area of the Amazon valley of Brazil.

For many years a familiar sight at dusk was a flock of Chimney Swifts that roosted in a large chimney across the street from the southern edge of the Zoological Park. Then for some reason the birds abandoned that haunt. Flocks are still to be seen in outlying parts of the Bronx, whirling in an ever-shifting cloud around chimneys and scaling off, two or three or even a dozen at a time, to plunge into the dark roosting place.

Chimney Swift migration is in progress now. The journey starts in August and continues well into October before the last of the great flocks leave the United States and start through the West Indies and across the Gulf of Mexico. So far as is known, the birds migrate during the daytime only.

On the return trip next spring, the swift reaches the Gulf Coast around the middle of March and "spreads out and ranges from the Atlantic Seaboard westward to eastern Texas, Montana and central Alberta," it is reported by the Fish and Wildlife Service of the Department of Agriculture. Its northward speed depends on the supply of insects in the air for, according to W. L. McAtee of the Service, "The bird's food consists almost wholly of insects, and beetles, flies and ants are the principal items. It gets many beetles, the most serious enemies of our forests, when they are swarming, and takes also the old-fashioned potato beetle, the tarnished plant-bug, and other injurious insects. The bird is, of course, largely beneficial to the agricultural interests of the country."

PATAGONIAN CAVIES

Four Patagonian Cavies (*Colichotis magellanica*) have been added to the mammal collection – the first of their kind in 16 years.

These big rodents, which stand about 13 inches high at the shoulder, are among the commonest of all small mammals on the vast waste lands of southern South America, but they are fairly rare in collections in the United States.

They are excellent exhibition animals, having the advantage of being active in daytime. Most members of the cavy group feed and travel at night. The newcomers are now at home in the old Prairie Dog enclosure.

* * *

In the May-June issue of Animal Kingdom we called attention to the family of mallard ducks that had hatched somewhere on or around the Lion Island and were swimming contentedly in the wet moat at the south side of the island. During the first week in September the young ducks attained sufficient growth and strength to fly out. Eight birds out of two broods remained at the end of the summer, and all got away safely except one, which managed to fly out of the moat, but immediately pitched down in the Water Hole on the African Plains, close beside a Marabou Stork. Before a keeper could go to the rescue, the stork had killed and eaten the duck.

"Old Nellie" was in her heyday when this portrait was made many years ago, but if a photograph were taken today it would show scarcely any changes, for Nellie has remained in blooming health for forty years.

MATRIARCH OF THE ZOO

Every well-ordered zoological garden takes great pride in its longevity records. Not only do they bolster reputations for skill in technique but they furnish an affirmative answer to the oft-repeated question: "Are the animals happy?"

At various times, the position of patriarch has been held by an alligator, a bear or a pelican. Now "Nellie," our aged Griffon Vulture, definitely holds the honor. Nellie is really old. Other bearers of the torch have carried on for twenty years, or even for thirty, but on August 23, 1942, Nellie completed a span of forty years in the Zoological Park. Written on the ancient records, is Nellie's line: "A – ♀ specimen. Purchased August 23, 1902, $25." On the same sheet, under "Notes," appear two entries: "1907 – Laid an egg March 3" and "1909 – laid an egg February 21."

With one rather important exception, that is Nellie's early history. The exception is embodied in further record entries: "♂ specimen, August 1, 1907, from London Zoo, 5 £" and "♂ died October 18, 1920."

In these cryptic lines we find the story of Nellie's arrival at the fledgling Zoo and her period of at least partly fruitful romance, which ended with the death of her mate, after thirteen years. We recall this male very well; he could always be distinguished by a dark halo in the otherwise white down about his eyes. In case of error, a particularly vicious temperament promptly advised the unwary.

Nellie's egg-laying never reached an optimum result. The first egg was quickly broken; the second was incubated with some diligence but not with enough to prevent its being frozen during a few moments' dalliance.

Nellie seems to have done a little better than merely to achieve distinction as the oldest specimen in the Zoological Park. The longest span accomplished by a Griffon Vulture in captivity was one of 37 years, in the Copenhagen Zoological Gardens, as recorded by Major S. S. Flower, in "The Duration of Life in Vertebrate Animals, 1925." So it seems that Nellie's 40 years will stand as a record, which she herself may well exceed. For except for troublesome corns, Nellie is in excellent health and, at liberty on the African plains, enjoys her pound of raw horse meat daily.

It is true that a younger Griffon, purchased from the late Ellis S. Joseph, in 1925, will carry on Nellie's tradition, when her time runs out, but it will never quite fill the niche that could have been occupied by an actual Young Nellie.—L. S. C.

PUBLICATIONS OF INTEREST

FADING TRAILS. The Story of Endangered American Wildlife. Prepared by a Committee of the United States Department of the Interior—National Park Service, Fish and Wildlife Service: Daniel B. Beard, Chairman; Frederick C. Lincoln, Victor H. Cahalane, Hartley H. T. Jackson, Ben H. Thompson. Edited by Charles Elliott. Illustrations (four in color) by Walter A. Weber. The Macmillan Co., 1942. Price $3.00.

"Thirty Years Later" would have been an appropriate title for this useful and informative volume, at least for those of us who recall the days when the Zoological Society was deeply involved in the struggle to save the remnants of our wild life. And it would have come within a few months of complete accuracy, for it was in January, 1913, that "Our Vanishing Wild Life" was published by Dr. Hornaday, militant leader of our efforts in the field of conservation.

Dr. Hornaday would have liked "Fading Trails." Thirty years ago, there appeared to be little hope for the survival of the Trumpeter Swan, our many species of ducks and geese, the Whooping Crane. Now, waterfowl in general appear actually to be increasing and even the Whooping Crane is at least holding its own. The stories of these and many others are written here by leading experts, each a specialist in his own particular branch, although there is no indication of individual authorship.

There are thirty-one chapters, five of which are devoted to general conservation matters, while twenty-six concern particular species. These range through mammals, birds, fishes, turtles, crocodiles and lobsters, giving, in each case, the history of the species and its present status. The general tone is one of encouragement. One gets a definite impression of early if sometimes belated efforts to give protection where it was needed, which at last appear to be producing the hoped-for results.

Mr. Weber's illustrations are very good indeed and are an excellent indication of the progress that has been made by this promising young artist. A bibliography and an index are two important features which publishers are not always willing to include. — L. S. C.

MAN AND THE VERTEBRATES. By Alfred Sherwood Romer. University of Chicago Press. Revised edition, 1941. $3.50.

Man did not just happen. He is the result of biological forces working through millions of years. "Man is a member of that series of living creatures known as the vertebrates, or animals with a backbone, a group including not only all the other warm-blooded, hairy creatures to which man is closely allied but such varied forms as birds, reptiles, frogs and salamanders, and fishes. Their history is our history; and we cannot properly understand man, his body, his mind, and his activities, unless we understand his vertebrate ancestry."

Professor Romer traces man's evolutionary history through a period of some four hundred million years and gives an excellent account of the many ways in which he and his backboned relatives have changed since the record began. A fascinating story is unfolded, especially for the student who is seeking an authentic, condensed yet comprehensive account of man's emergence from the past.

The several hundred illustrations are extremely well chosen and in themselves vividly demonstrate man's relation to other vertebrates. In connection with numerous diagrams, they make a strong presentation of the factual evidence.

"Man and the Vertebrates" is a new and revised edition of an eminently successful text book. To the student of biology, it is practically a "must," but it is written in a language remarkably free from technicalities and the average person will find it absorbing and extremely informative reading. — C. W. L.

ON GROWTH AND FORM. By D'arcy Wentworth Thompson. Cambridge University Press, The Macmillan Co., 1942. *A new edition,* pp. 1116. $12.50.

This volume is either a new edition of an old book or a new book containing some old matter, depending on one's point of view. The original edition of 1917 contained 793 pages, the present thus showing an increase of 323 pages, which alone amounts to a presentable volume in itself. There are seventeen chapters with headings that for most part were used in the first edition, many new illustrations, and the approach to the subject is unchanged.

To do even moderate justice to this book each chapter should be the subject of a separate review. Although the author covers an immense field, which superficially might make the book appear "spotty" to some, it actually holds together very well if considered as a treatise on the geometry of organism, which, of course, is the author's intent. In a brief review of this kind it is thus only possible to mention some of the items which happen to strike the reviewer as especially good or bad, and unsatisfactorily to attempt a reduction of one's evaluation of the entire effort to the compass of a few words, a procedure neither fair to the author or the reviewer. It is not a book to sit with and read through, but rather a book to be kept handy for reference to problems at hand. It so happens that one of the new chapters, "On the shape of eggs and of certain hollow structures," has already yielded me some valuable data, pertinent to a current bothersome problem. The discussion of symmetry, spread through various chapters, has been the final determinant on which of two half-finished manuscripts on theoretical matters will be the next to be pushed through to completion. These items are mentioned merely to indicate why it is considered a "tool" book by the reviewer. In other words this bulky volume is already on its way to become one of my much-thumbed books. This is probably the nicest thing one can say about an author's efforts.

There can be little question that the earlier edition was both praised and largely ignored, despite the large number of papers that have appeared since then discussing various features of heterogonic growth. In recently addressing a group of six graduate students expecting to become biologists, I was dismayed to find that not one of them had ever heard of Thompson's Cartesian transformations. Thompson himself seems to recognize this when he writes, a little sadly, in his "Epilogue," after a lapse of twenty-five years, "My task is finished if I have been able to shew that a certain mathematical aspect of morphology, to which the morphologist gives little heed, is interwoven with his problems, complementary to his descriptive task, and helpful, nay essential, to his proper study and comprehension of Growth and Form." Whether the difficulty is inherent in the subject matter and the translation of morphological data into mathematical language is merely an academic exercise, as some would have it, or whether the difficulty is inherent in the minds of morphologists and mathematicians, and both are actually neglecting valuable approaches to a deeper understanding, is something that could be argued endlessly.

In the actual writing of the book Dr. Thompson apparently took the original edition and added to it as much data as he was able to lay hands on and digest in the interim, which is certainly the only satisfactory way to bring a book down to date. His all too brief discussion of the more recent aspects of topological analysis as applied to biological partitioning was found to be of especial interest and full of suggestive approaches to such diverse things as the placement of veins in the insect wing and the number of parts to a jelly-fish. The chapter entitled "The Equiangular Spiral" considers in some detail the geometry of gnomonic figures, including the famous root-two gnomon, logarithmic spirals and other matters that have been talked of from the time of the Greek mathematicians, even if often in a quasi-mystical manner. Although these interesting mathematical expressions may be used to describe a great variety of growth characteristics in natural objects, the full significance of them still appears to elude the grasp of man. The much quoted chapter "On the theory of transformations, or the comparison of related forms," with its oft-copied illustrations, has been relegated to the end with some expansion and new figures along with the old matter. The chapter seems to note a suggestion of sorrow that morphologists have not more often invoked this method of comparison, and certainly in the quarter of a century between the two editions little application has been made of it by others. This is evidently due somewhat to the suspicion on the part of many that the erection of Cartesian coordinates about an animal form and the distortions of these that related forms fit so well, do not lead to productive results. Perhaps this is so or perhaps it is only apparently so for want of abundant application to various classes of material.

One approach to the work of Thompson is to consider it as bridging the gap between the morphologist, in the restricted sense, and those investigators who delight in making inorganic mixtures or models which frequently show, in a striking fashion, certain of the aspects of living systems, such as Traube, Leduc, Butschli, Herrara, Walker, Jennings, *et al.* The work of all of these he mentions and many others besides, but the more numerous conventional morphologists do not fare so well. While it is understood that even in such a thick volume there must be many omissions, condensations and oversights, the reviewer was a little disappointed at the slight reference to the work of W. K. Gregory. Although not adopting Thompson's methods, Gregory, on a basis of his own devising, has discussed in many places such things as morphological transformation, position, number and distortion. In fact he has, within recent years, established his own terminology involving the reduplication of structural units so as better to set forth his views. This is, in its final analysis, very close to much of the matter treated at length in the present volume and certainly deserved greater recognition. I, for one, would have much liked to learn of Thompson's evaluation of Gregory's studies in the light of the former's special views on organic mechanics.

Finally it may be said that no matter what destructive criticism might be leveled at this huge effort, there is undeniably bound to be a large residuum that is extremely solid. It is unquestionably of great value in any biological study to be able to point out clearly that this or that structure or activity is purely the physical and chemical working out of processes not peculiarly biological. If everything can be reduced to such terms it would point to a thoroughly mechanistic view; if, on the other hand, there always remains an unresolvable residue, not so reducible, then some "newer" vitalistic concept, in the sense of a measurable but peculiarly biological attribute, might find its place. A try at determining this in the Thompson manner is certainly complete justification for his work. In so doing to have produced a valuable reference work addressed to both biologists and mathematicians is a true accomplishment of permanent worth.— C. M. BREDER, JR.

BOOK BARGAINS

Publications of the New York Zoological Society
Offered at Savings of 50¢ to $1.50

THE AMERICAN BISON By Martin S. Garretson

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for the first accounts of its appearance and habits, pictures its wide range and incredible numbers. It sets forth authentically the natural history of the animal, describes the tragic course of extermination that ranged unchecked until there were only 1,091 bison left in the whole of North America, and then it tells of the rise and development of a strong national sentiment that saved the species from extinction. *254 pages, 65 illustrations.*

Was $2.50 . . . . . Now $1.50

PETS AND HOW TO CARE FOR THEM By Lee S. Crandall

As Curator of Birds in the New York Zoological Park, Mr. Crandall has responsibility for the diet, health, cage conditions and general well-being of some 2,000 birds of many species. Out of his experience with the Zoological Park's collection and a life-long enthusiasm for pets of every kind, he has written a completely authoritative and practical book on pets and their maintenance in good health. He devotes individual chapters to Dogs, Cats, Domestic Rabbits, Small Wild Animals, the General Care of Birds; Pheasants, Peafowl and Guineafowl and Quail, Waterfowl, Parrots, Cage Birds, Canaries, Domestic Pigeons, the General Care of Fishes and Aquarium Fishes. *296 pages, 96 illustrations.*

Was $2.00 . . . . . Now $1.00

PRESENT DAY MAMMALS By Claude W. Leister

Students in Zoology and Biology classes and the general reader who has often been puzzled by the relationship of animal groups will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. It answers such questions about mammals as: What does it look like? How big is it? To what is it related, and why? Whence does it come? Typical representatives of every Order of mammals are pictured here, accompanied by a clear text explaining the zoological status of the animals. *74 pages, 106 illustrations.*

Was $1.00 . . . . . Now 50 cents

Order from:
Department B, Zoological Park, Bronx Park, New York City
(Make checks payable to New York Zoological Society)

XLV • No. 6 NOVEMBER–DECEMBER 1942

6.73
59

M

ANIMAL KINGDOM

SONIAN INSTITUTION
DEC 1 2 1942
NATIONAL MUSEUM

BULLETIN, PUBLISHED BY THE
NEW YORK ZOOLOGICAL SOCIETY

BEEBE LOOKS THROUGH A GLASS CLEARLY • PICTURES OF JUNGLE CITIZENS
CHES THAT WERE NAMED FOR DARWIN, *Robert T. Orr* • NEWS OF ZOOLOGICAL PAR

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

ASST. TREASURER
City Bank Farmers Trust Company

EXECUTIVE COMMITTEE
Laurance S. Rockefeller, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field
De Forest Grant
Warren Kinney
William De Forest Manice
David H. McAlpin
Robert Moses
Fairfield Osborn

BOARD OF TRUSTEES

Class of 1943

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert I. Gannon
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Eugene Holman
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

William Bridges	*Editor & Curator, Publications*
Jean Delacour	*Technical Adviser*
Millward W. Heath	*Supt., Construction & Maintenance*
Donald Marcy	*Associate, Educational Activities*
C. J. McGahey	*Comptroller*
John Tee-Van	*Executive Secretary*

ZOOLOGICAL PARK

W. Reid Blair	*Director Emeritus*
William Beebe	*Honorary Curator, Birds*
Lee S. Crandall	*Curator, Birds*
Leonard J. Goss	*Veterinarian*
Claude W. Leister	*Curator, Mammals*
Harry C. Raven	*Associate in Anatomy*

AQUARIUM STAFF AT ZOOLOGICAL PARK

Charles H. Townsend	*Director Emeritus*
Charles M. Breder, Jr.	*Director*
Christopher W. Coates	*Aquarist*
Ross F. Nigrelli	*Pathologist*
George M. Smith	*Research Associate in Pathology*
Homer W. Smith	*Research Associate in Physiology*
Myron Gordon	*Research Associate in Genetics*

DEPARTMENT OF TROPICAL RESEARCH
William Beebe, *Director*

Jocelyn Crane	*Research Zoologist*
Henry Fleming	*Entomologist*
George Swanson	*Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE
NEW YORK ZOOLOGICAL SOCIETY

VOL. XLV NOVEMBER-DECEMBER No. 6

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York, N. Y. Title registered with United States Patent Office.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

A Look Back—and Ahead

Questions, of the soul-searching variety, have been raised occasionally within the last year as to just what course educational-recreational institutions should pursue in wartime. These have already been largely answered by the well-maintained attendance figures recorded by leading City institutions. In our case, we will run to almost two and one-half million visitors in the Zoological Park this year despite one of the rainiest seasons on record and the cutting down of motor traffic. Those unfailing barometers of popular interest—the press and the newsreel—have steadily recorded happenings at the Zoological Park as well as related activities of the Society. Our two latest films have been seen by millions of people in this country, in Canada and in South America. In all, the public-appreciation quotient has never been higher. Despite war conditions, we have been able to develop a number of new projects, although the completion of the modernization of the Zoo, the building of a new Aquarium, the establishment of a Research Center, of a conservation exhibit, and other major moves, will obviously have to wait until the war is over.

A number of staff members are busy on war problems. In general, we are "sticking to our last"—in other words, doing our utmost to serve the public along our accustomed lines, and at the same time preparing plans for eventual major peacetime opportunities so that we may fulfill the many potentialities that lie ahead. Public endorsement, as evidenced even in wartime, demands this.

Fairfield Osborn

YEAR'S END

Under its new name of ANIMAL KINGDOM, *the former* BULLETIN *of the Zoological Society has completed the first year of its existence—45 years from the starting point on June 1, 1897, when the first number of the* BULLETIN *was distributed to the Society's membership. The new name seems to have met with general approval, even though it is a serious business to change the title of a publication so long and so familiarly identified with such a Society as ours.*

●

NEXT YEAR

As President Osborn says in the adjoining column, the Zoological Society has a great many important projects ahead of it, and some of them are not war-bound—we can begin to put them into effect even in these disturbed times. In 1943 ANIMAL KINGDOM *expects to have many occasions for reporting new or modified exhibits in the Zoological Park but we are going into the new year with a renewed determination to emphasize the life histories and the behavior of the animals in our great collections—and even beyond the scope of our collections. Truly our kingdom is the whole Animal Kingdom.*

IN THIS ISSUE

Christmas Picture—Reindeer in the Zoo . . . . COVER
Stoep Studies . . . . *William Beebe* 131
Citizens of the Jungle 138
Darwin's Finches . . . . *Robert T. Orr* 142
Problem Animal: The Moose . . . . *William Bridges* 146
Behind the Scenes; News and Notes 151
Index to Volume XLV 155

DEC - 8 1942

This is the "stoep," this is the powerful binocular and this is the author — the combination that produced the vivid impressions of Venezuelan animal life set down in "Stoep Studies."

Stoep Studies

Comedy and Tragedy and Beauty Parade Before the Lens of a Powerful Glass on the Stoop of a Venezuelan Laboratory

WILLIAM BEEBE

MOST OF THE THINGS I do, or attempt to do, are based on the fact that we humans are about six feet in height. This self-conscious thought does not result in self-congratulation or a thankheavenweareasweare smugness. On the contrary, it is the both ways limitations of six feet of verticality which inspire each new effort. Years ago I studied the animal life of a square yard of jungle floor, overcoming the pitiful presbyopic blindness of my normal human eyes by magnifying the minute creatures with microscopic aid. On my recent Venezuelan expedition I determined to do everything possible to overcome the handicap of equally deplorable human myopia in the observation of wild life.

There were many hours throughout the past half year when I could not make two jungle trips a day or when my eyes were weary from microscopic work. These odd times were spent in patient Stylitian watch from the square yard and a third which comprised the uncovered stoop at the door of our Caripito laboratory. In the spirit of O. Henry this essay might be headed Piazza Pryings, Verandah Viewings, Gallery Gazings or Porch Peerings, but the good old Dutch cum New England *Stoep* seems best.

This little platform was reached by seven steps and was six feet above the ground. Its confines were only just large enough to hold myself and the spread tripod legs of my giant binoculars. This combination made me the diurnal optical center of a hemisphere of clear vision, stretching from fifty feet away to the seventy-five mile distant range of mountains of terrestrial space, and at night from the moon mountains through the nine hundred thousand light years from my stoop to the spiral nebula of Andromeda.

The optical battery consisted of a pair of huge binoculars, standing six feet high, with four-inch oculars, and a revolving eye-piece with powers of 12, 20 and 40 diameters. These made a bird in the eye worth a hundred in the bush, hand, or specimen drawer. Thirteen years ago Mr. Herbert Satterlee made me a present of these glasses, and I have used them constantly in Bermuda, keeping watch over our boats trawling and dredging far out at sea and making detailed notes on migrant waders. Fair Osborn may remember Finsler's Comet which thrilled him one midnight from the roof of New Nonsuch. But the glimpse of that distant, passing world was no more wonderful than the scenes which were to come to me through the lenses in Venezuela.

Now for the first time, I had the glasses in the tropics, and for a half year Herbert Satterlee was the deus ex machina who enabled us to work magic on our porch, to annihilate space, to add a great many facts to human knowledge and to bring joyful amazement to ourselves and our visitors. Whenever I concentrated on some exciting happening, the glasses ceased to exist as a separate entity, and became a very part of me and I often wondered what the vultures soaring overhead made of this strange being with five legs and tubular eyes, slowly moving about a small, elevated wooden porch.

A hint of the optical power of the three lenses will help to justify my enthusiasm. At fifty feet with the lowest power I could distinguish the pattern and colors of the eye of any tropical fly,

DEC -8 1942

Far across the plains at Caripito with its low brush rose mountains clothed in lush jungle and thus the Department of Tropical Research had within its collecting range a variety of habitats. This is the view from the porch of the Department's headquarters at Caripito — the hunting ground of Dr. Beebe's binoculars and his observing eye.

while at one quarter of a mile I could detect the scent gland on the hind wing of a butterfly. The twenty-diameter medium power showed any creature down to one and a quarter inches a full half mile away, and at a quarter mile, after dark, a porch light on a bungalow would reveal to my eyes not only a tree frog clinging to the tiles, but the disposition of its limbs, its faint nocturnal pattern and the amount of webbing between its outspread toes.

Having attracted your attention to my *Stoep* (there would not be room for both of us in the flesh) it seems proper to let you envisage the panorama. Directly behind is the laboratory and home placed at the disposal of the Zoological Society's Forty-third Expedition by the hospitable officers of the Standard Oil Company of Venezuela. When we took possession it was distinguished only by the number D-176, but we remedied this at once and nailed up a blatant MANICOMIO, thereby voicing in Spanish the politely concealed conviction of many of our visitors.[1]

Our domicile was probably the simplest in camp and at the same time the most practical for our purposes, as comfortable as a palace, and with far and away the loveliest view. It was elongate, mounted on piles, the walls of double plywood, wholly glassless but with such an amount of screening that our privacy was only one remove from that of the proverbial goldfish. Double screen doors were provided, but these we propped open day and evening, welcoming the strange and beautiful insects which came to our lights. With electric refrigerator, drinkable running water and all the comforts of home, we count this as one of the most arm-chair yet profitable of our two-score expeditions.

The *Stoep* was at the west end of the building and if we peered around the corner to the east, we could see the great rambling mess-hall several hundred yards away, while in the foreground was tethered patient "Humboldt," the precious Ford station wagon which was our link with jungle and llanos, mountain and river. Swinging around to the south there came into view a deep, narrow ravine or quebrada which marked the edge of our particular compound. Beyond the farther rim were dozens of cozy red bungalows housing the general officers, with our good friends the Linams, Clarks, Grimes, Kahles, Howards and Bates in the nearest. From the southwest clear around to the east again we were bounded, at the end of the sloping lawn and a low cecropia jungle, by the vine-clad camp fence, an affair of netting and barbed wire. Beyond, stretched all Venezuela in a deep, wide, lovely valley with a few thatched native huts among the wild growth and flashes here and there of the Caripe River. Finally, the west and north horizons were filled with range upon range of high, rugged mountains clothed in jungle to their lofty summits, all made to order to set off the splendour of tropical sunsets.

---

[1] In English *manicomio* means an asylum for the slightly demented, or, more vulgarly, "bughouse."—Ed.

A few scattered "peerings" will show the possibilities and value of this method; let us say three, illustrating comedy, tragedy and beauty.

I stood on the little stoop for the first time at six o'clock on February nineteenth, and as I looked toward the sunset which seemed two-thirds aurora and broken rainbows and the rest active volcano, three flocks of giant green orioles —caciques is the better word—drove past straight into the western cauldron, and two tiny mango hummingbirds in juvenile garb caught flies in mid-air from the bare twigs of the nearest tree. September first, one hundred and ninety-five days later, on my last evening, I watched the bands of caciques, doubled now with accretions of young birds, still siphoning into a flaming hesperian glory. And from the same twigs, the two identical hummingbirds, now in the full iridescence of adult plumage, were still catching flies.

In themselves these be small happenings—orioles migrating overhead, diminutive hummers fly-catching, but after more than a half year, when considered with other occurrences, they become important and fraught with significance. My day by day notes show the rise and decline of instincts, the development of independence in young birds and other creatures, initiation of migration, the rudiments and the vestiges of courtship and song, and the discovery, both by imitation and by pragmatic experience, of the life and death distinction between friends and enemies. Even the progress of molt came clearly to my eyes, revealed in the wing silhouettes of birds flying hundreds of feet up in mid-air.

On July twenty-eighth at five forty-five in the morning, rain began to fall, and returning flocks of caciques broke up and sought shelter in the dense foliage of nearby trees. Two days before, one of our largest trees had fallen before the force of a short, cyclonic storm. As the rain began a score of birds circled around and around for some time in the exact place in mid-air where the branches of the eighty-foot tree had been for a century or more. It was definitely a precise locality memory of birds accustomed to use this particular tree. I noticed fading hints of this instinct more than two weeks later, and it reminded me of the fish-hawks of Gardiner's Island, who continued nesting on the upturned roots of trees which had succumbed to the increasing weight of the enormous nests of generations of the ospreys.[2]

Sheltered within the laboratory vestibule I watched one pair of caciques throughout the rain, as they perched in full view high up and about two hundred feet away. Through the glasses they seemed at arms' length, and I could detect even the worn feather tips, for molt had just started. As the rain began the two birds moved close together. The colors of the small female were the brighter, with tip of the beak vivid scarlet, and the base and crown plate turquoise blue. His hues had faded to ivory white and pale pink, but his affection still glowed in a quiet, tender way. Continually he touched her head and neck with his beak tip, now and then making me flinch as the sharp point seemed actually to press against her open eye. Occasionally he took her beak in his, but she objected to this and shook him off.

When the sheets of rain descended so that the birds seemed to be ouzels of sorts behind a water-fall, both drew in their necks and waited motionless, dripping. A lone bird overhead shook additional showers upon them but they never moved. At the least letup both instantly reached

---

[2] *Bulletin New York Zoological Society,* 1903, p. 118.

Great flocks of giant orioles — caciques — passed the laboratory each day and as they drove toward the sunset the camera on the porch recorded their passing, and the binoculars on the stoep took note of the major events of their lives — the beginning and progress of molt, the accretions to the flock as the juvenile birds joined the flight.

for their oil glands and began preening their wings. The body plumage might be thoroughly saturated, but the wings were their insurance against the seventy-foot distance to the ground, and must be kept ready for instant use. He even helped to preen her primaries and for the first time she responded, arranging his neck feathers, the avian analogy of tying one's husband's white tie.

It was soon evident that the immature bird perched overhead was their offspring, and when he approached too closely they repelled him only half-heartedly. He hopped a branch or two away and when the sunshine threatened to sift through the drops, I saw him brace his feet well apart and suddenly show all the symptoms of becoming violently ill. He raised both wings, opened his mouth, stretched far out and down and after a silent spasm actually lost his foothold, slipping around the branch until he hung upsidedown. Then came a flurry of scrambling, and bedraggled and considerably mussed he regained an upright position, and looked about as if hoping no one had seen him. Both parents watched him with whatever emotions can be expressed by the handicapped medium of two eyes and a pointed, horny beak.

The sun now blazed forth and with a rainbow arching the tree the male green cacique went through his full courtship ritual, an unseasonable but complete routine. Wings slowly spread wide and curved outward, head and body dipped leisurely downward until almost inverted, and with it, in perfect accompaniment came that inimitable, rich, melting crescendo, as if all the warm tropical raindrops were pouring over his avian syrinx, a liquid melody ending in the lyrical, far-carrying syllable *"Coco-malt!"* Graceful as the sweeping bow of a trained courtier, harmonious as a fan-fare of trumpets for a queen is the courtship of a green cacique.

Where the trees towered overhead and the underbrush was thick and tangled, observations of bird life were almost impossible without a powerful glass. Crouched in the low vegetation (at the bottom of this picture) Dr. Beebe spent hours watching the minute but tell-tale actions of the 40-odd species that inhabited this berry-tree.

I looked back at the youngster and suddenly realized that he had not been afflicted by a wave of nausea but by an explosion of incipient courtship, the first precocious manifestation of fledgling love. It was all doubtless unconscious instinct, the waning and dawning all controlled by internal endocrine alarm clocks and set triggers of hormones, but through my precious lenses it just seemed a pitifully juvenile attempt at being a grownup (analogous to the first cigar), followed by a paternal showing-off of how it should be done.

When all six wings were oiled, furbished, tidied, flirted, combed, fanned open and shut, each primary flicked, fluffed up and depressed, the female cacique gave a quick glance around, and took off due east through the clean-washed air, followed dutifully by husband and son. I swivelled my binoculars and before the birds passed from view I saw that the female had lost her third pair of wing feathers and the male his fifth in the season's molt. Junior had to flap a little faster to keep up with the steady, strong beats of his parents. I should doubtless see them as they swept back and forth on their daily migrations, but I should never be able to recognize them. For a half hour in the rain, thanks against to Herbert Satterlee, I had magicked a family of caciques within arm's length, learned from them and seen them on their way.

Little by little my binocular notes fell into place and the world of bird life as seen from my stoop began to mean something coherent; the residents, the migrants, the visitors, the refugees and finally those which will always remain only voices in the night. Back of everything and controlling almost all life was the fourth dimension of the seasons, dry and wet. The dry was in full swirl on our arrival and it gained steadily in intensity until birds, beasts, fish and insects all had to change their habits to meet and to cope with it.

One day as I was panning the glasses along the cecropia jungle, looking for a possible stray or rare bird, I noticed a thrashing of tall, dry weeds. I marked it carefully, swung the glasses lower and there came into view a medium-sized bushmaster half through the fence mesh. A partly digested lizard, as I later found, prevented his further advance, and the keeled scales made impossible his withdrawing. A small battalion of army ants had found him and death was only a question of time. He lashed about impotently, five feet of agony, mouth wide, venom dripping, while on the other side of the fence his tail vibrated like a rattler's. Hundreds of the terrible insects were attacking and my whole sympathy went out to the serpent, so splendidly endowed for life, except when trapped by a mesh of steel which had no place in his cosmos. I walked the couple of hundred feet to the fence and quickly killed the bushmaster. He proved to be only the first of a half dozen, some of them big fellows nearly nine feet overall, who were forced out of the neighboring jungle in their search for moisture. Day after day they were brought in, the deadliest of creatures made desperate by unseasonable drought.

The very next day the motive of my glasses shifted from tragedy to beauty. A hawk in the hand is a dead hawk, or else hooded and hobbled beyond recognition, an avian slave trained to kill at man's behest. In the double magic windows, from my Caripito stoop, falcons, hawks and eagles paid no attention to my scrutiny. Their fierce, keen glance knew me for a harmless pentaped a quarter mile away. But at my end the light rays refocussed every movement, wink, shift of foot or feather only a few feet from my eyes.

In mid-April for day after day a lovely white-tailed kite hunted the quebrada a quarter mile off. The bird in full flight and the bird hovering might belong to different families. The usual flight was swift with deep-dipping flaps, faster but much like those of a gull, head in, tail nearly closed, the whole a compact, streamlined flying machine. Its colors were as delicate as its movements graceful, pearl gray above and white everywhere else except for jet black epaulettes, the ensemble set off by scarlet eyes and bright yellow legs.

My particular kite usually appeared in late afternoon, and after applying its feather brakes, swung around and came up wind perhaps three hundred feet above the ground, stopping at a definite spot in mid-air over the ravine. I say "stopping" advisedly for the kite went instantly into a hover, head and neck out, eyes searching every inch of foliage below, beak slightly agape

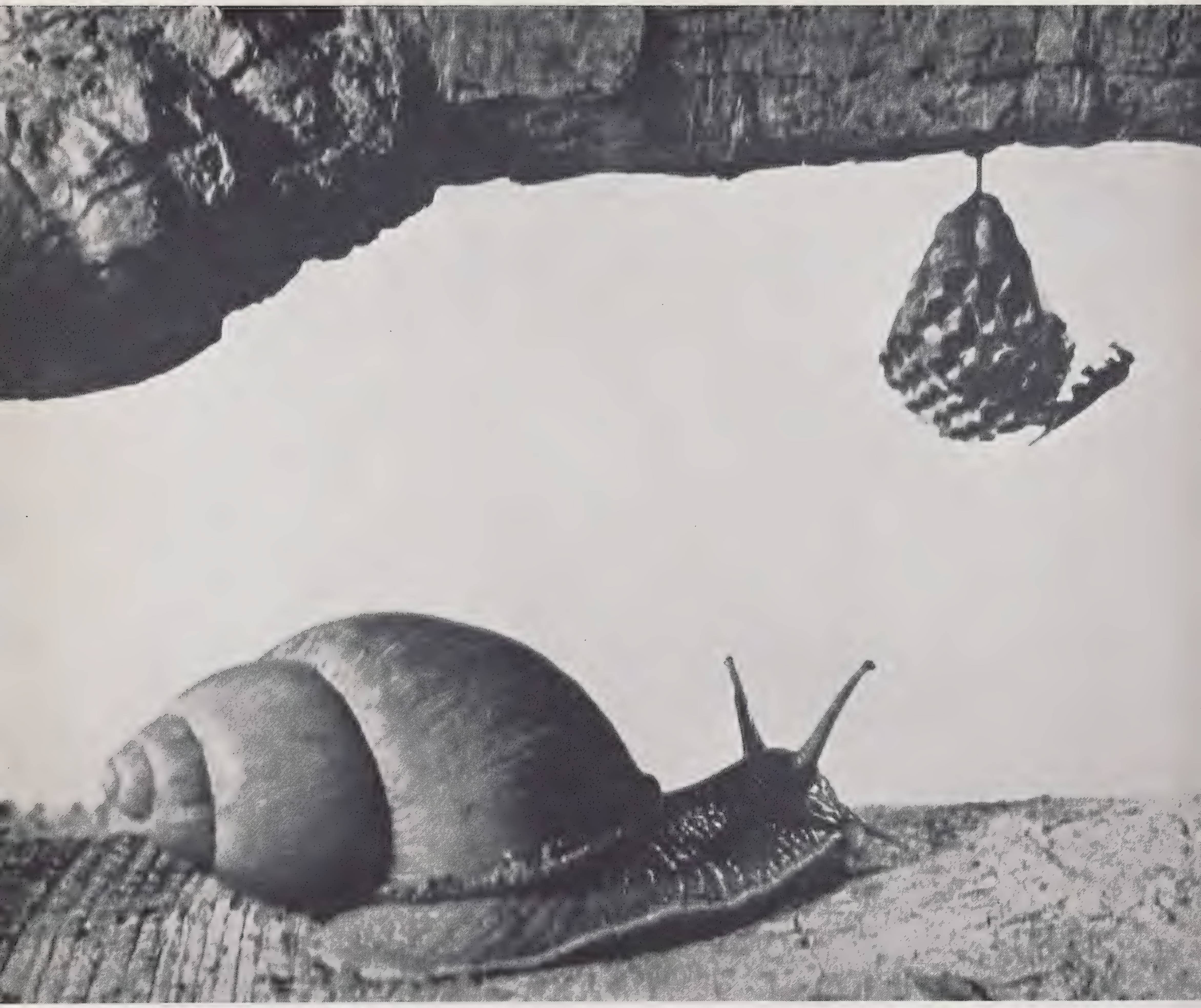
A working corner of the Department's laboratory at Caripito — a home for the expedition that was "probably" the simplest in camp and at the same time the most practical, as comfortable as a palace, and with far and away the loveliest view." At work, left to right, are Dr. Beebe, Henry Fleming, Miss Jocelyn Crane and George Swanson.

and tail fanned wide, showing as a semicircle of translucent white. The dangling legs and the talons opening and closing were of constant use in balancing. The wings full spread, thumb tufts out, fanned rapidly up and down.

Suddenly the whole aspect of the kite changed; the eyes remained fixed on one spot, the legs drew up and the wings stiffened. Their basal halves now hardly moved, while the distal, flexible "hands" clapped with redoubled speed within a very small arc. Through my glasses the bird seemed immovably hung on invisible wires, so quiverless was every part of its being, so completely in clear focus every portion except the wing tips.

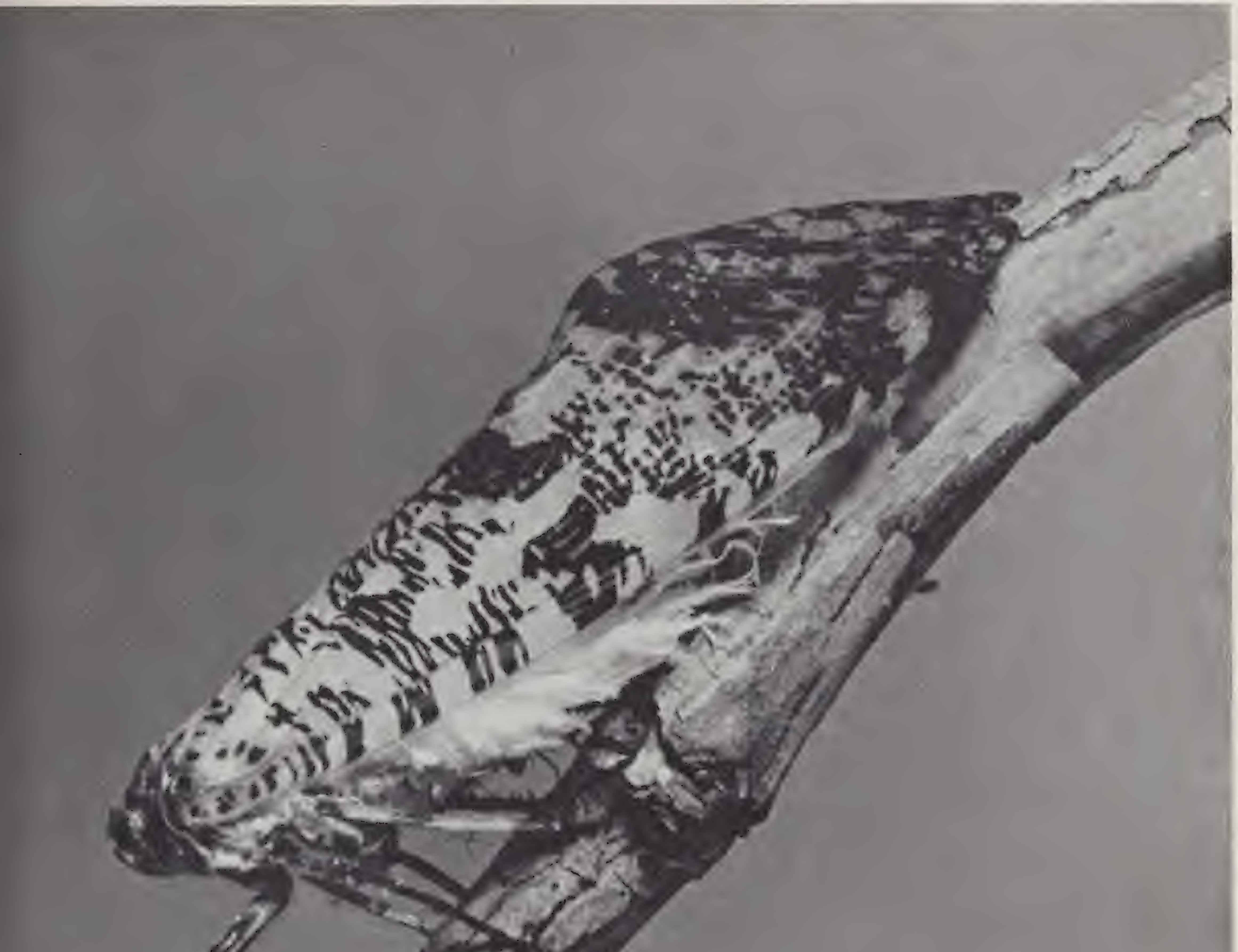
Then the wings drew half in, the tail closed and with no effort the bird dropped fifty feet, still keeping its horizontal position, tipping only slightly forward. Again it hovered. Twice more this happened, three stops on the way down, its glowing crimson eyes never losing sight of the prey. When the last stop was reached, not more than thirty feet above the ground, it fell straight, giving itself completely to gravity, an unbelievably swift dive, and in a fraction of a second, braked, snatched with both feet and rose. In its tiny talons was a twisting, gold-spotted lizard, one of the jungle runners. In spite of the weight the kite rose easily and when clear of the ravine reached down and with a single nip put an end to the struggling. Alighting on a branch gently as a thistle down it first shook itself and then looked searchingly in all directions.

I could see every marking on the lizard, every green and gold glint, for it was a male in full breeding color, and in its jaws I distinctly saw a narrow-winged katydid which it had just captured. My last view through the lenses was of the kite standing motionless, gazing across the wide expanse of the quebrada, straight at me through one of its crimson eyes. I said, "Thanks," aloud, and the musical hawk twitter which reached my ears I liked to think was the kite's equivalent of the polite Spanish *"de nada."* To my unaided human sight there was only a tiny, pale spot in a distant tree.

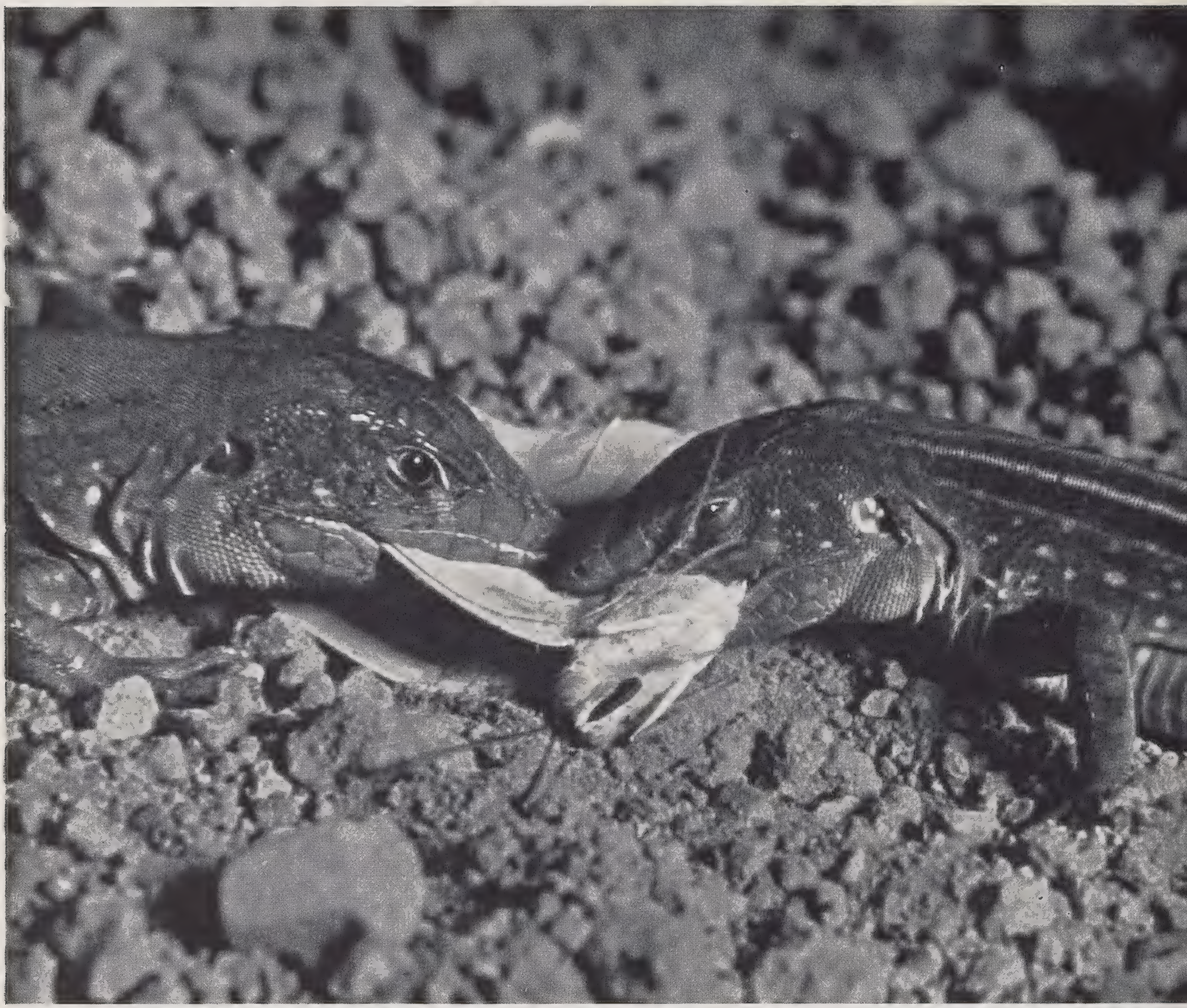


The giant snail of the Venezuelan jungle flows slowly along over the bark of trees, carrying its brown and rose-hued house and watching the busy wasps fashion their domicile out of wood pulp.

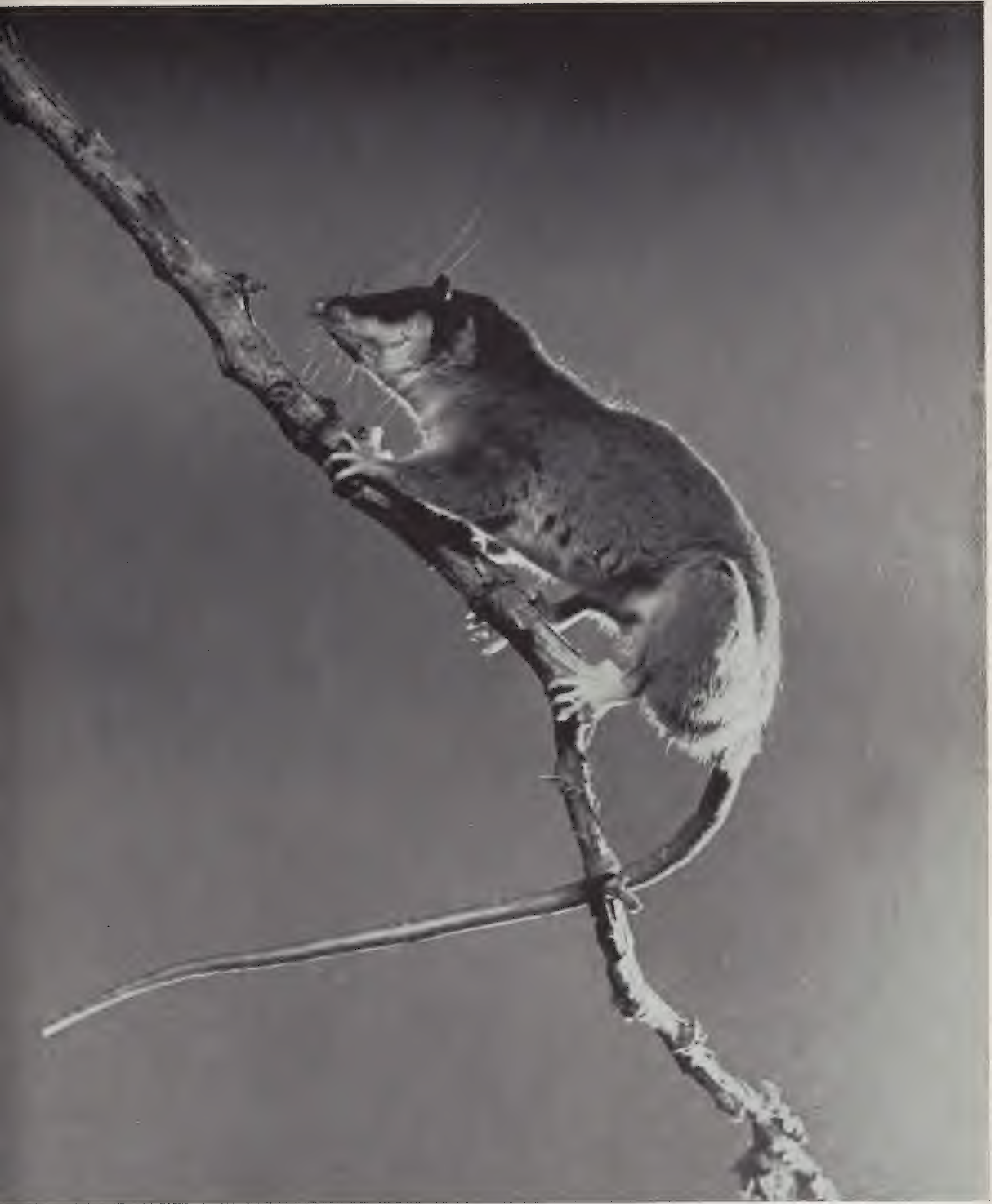
Citizens of the Jungle



Grotesque in appearance and with strange metamorphoses are the wax insects of the tropics. This large, unnamed form from Venezuela is unusually beautiful in pattern and color. A tangle of waxen filaments streams out behind when the insect takes flight.



For a great many years the question has been argued whether or not lizards feed upon butterflies. Here are two brilliant orange and emerald jungle runners which devoured many of these insects, wings and all.



The Mouse Opossum is the smallest of its kind. It has no pouch and its six to eight young wind their tails tightly around that of the mother, as she creeps all night long through the jungle foliage searching for grasshoppers, grubs and fireflies.

Darwin's Finches

For Safekeeping During the War, the Zoological Park Is Housing Some Extremely Interesting Birds from the Galápagos

ROBERT T. ORR
California Academy of Sciences

EVER SINCE the historic visit of Charles Darwin aboard H.M.S. *Beagle* in 1835, the Galápagos Islands, situated some six hundred miles off the coast of Ecuador, have strangely fascinated the scientific world. No doubt such unusual objects of natural interest as the giant land tortoises, from which the very name "Galápagos" is derived, the huge marine and land iguanas and the flightless cormorants have all contributed greatly to this end. No less interest, however, has been attached to that remarkable group of birds, commonly called ground finches or Darwin's Finches, which is endemic to this archipelago. I say remarkable because on this comparatively small group of isolated islands in the Pacific Ocean there are in the neighborhood of thirty distinct species and subspecies of finches belonging to five separate but closely related genera. In fact, certain individual islands alone possess as many as ten different species. This in itself is very unusual and presents an extremely complicated but none-the-less fascinating problem regarding their evolutionary development. Cocos Island, lying to the northeastward, midway between the Galápagos and the west coast of Costa Rica, contains the only other known representative of this group. Here a single species, *Pinaroloxias inornata,* the Cocos Island Finch, occurs.

In general appearance these ground finches are far from spectacular. The adult males of a good many of the forms are dull black or partly black. The females are rather drab, being a streaked grayish-brown. Young males, and in some forms even the adults, are identical in coloration to the females. Rarely, if ever, does one find such a large number of distinct types of related birds occurring over so limited an area and, at the same time, showing such lack of distinctive coloration. The differences in structure that exist are in general body size and, to a marked degree, in the shape and size of the bill. Such striking divergence occurs with respect to the latter structure, varying as it does from a heavy, grosbeak-like bill to a slender warbler-like bill, that different groups of these birds, now known to be very closely related, have in the past been placed in widely separated families. In habits and in song many of the species are nearly identical. One form known as *Cactospiza pallida,* however, possesses a habit so unusual as to make it unique in the bird kingdom. In searching for insects in holes too deep for its bill to penetrate it avails itself of cactus spines. Probing with one of these spines held in its bill it is thus able to secure food otherwise unobtainable. This, so far as known, constitutes the only example discovered wherein a bird makes use of a tool.

The ornithologist of the past has been all too prone to base his knowledge of relationships of various birds upon a preserved body and often even upon only the skin that housed the body. Great advances, however, have been made within the past few years in bird study as in other fields of human endeavor. Few students of avian research nowadays ignore the actual living animal, its environment and its responses to this environment.

With a view toward more clearly understanding the relationships of these unorthodox inhabi-

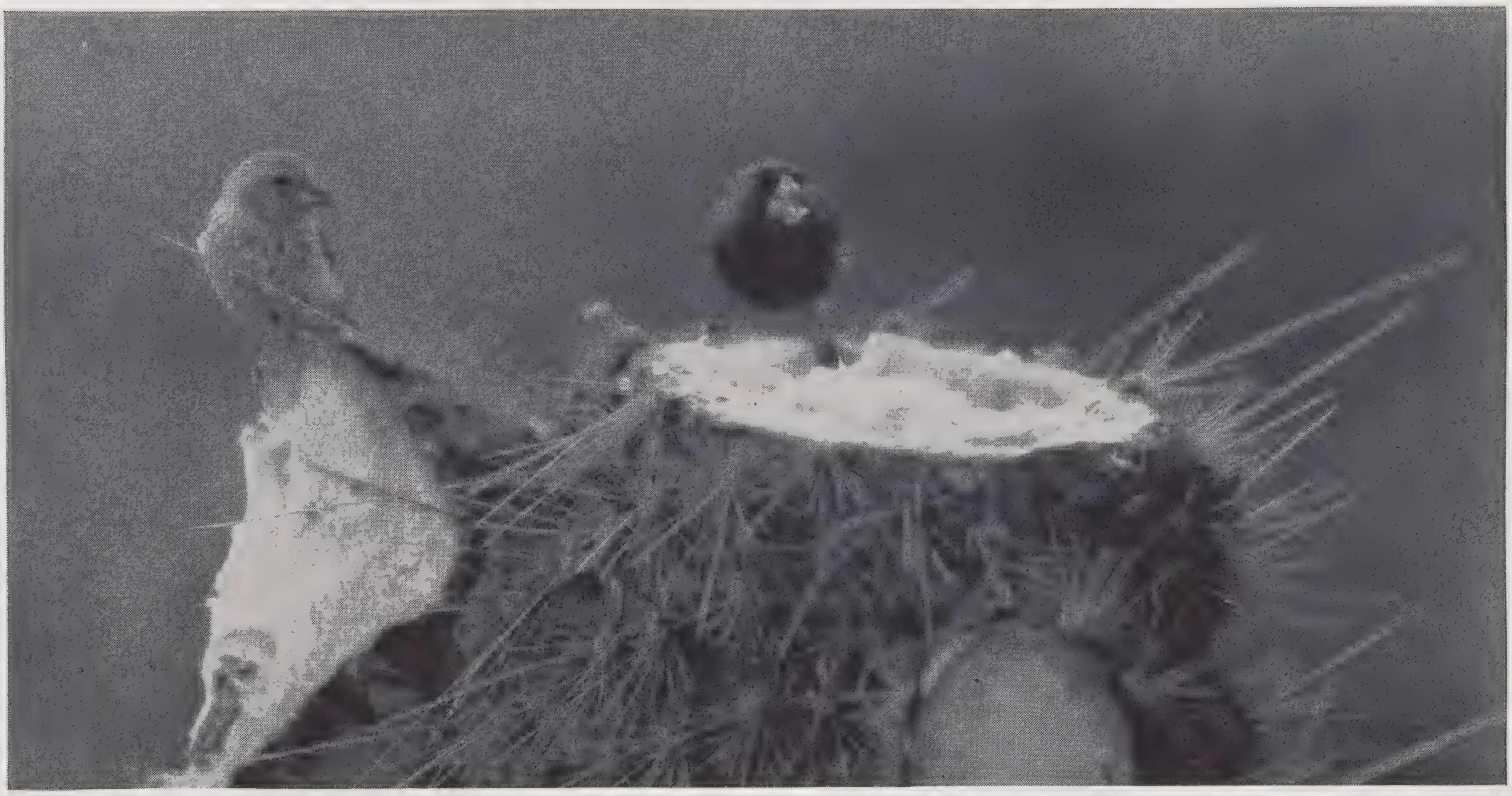
Photo by W. Chas. Swett,
Courtesy G. Allan Hancock Expedition

The lower coastal parts of the island of the Galápagos group are barren and arid, overgrown with cactus and a variety of other desert plants. A habitat of this kind may be occupied by a number of species of ground finches. This particular scene was taken on South Seymour Island and gives a very good idea of large areas of the islands.

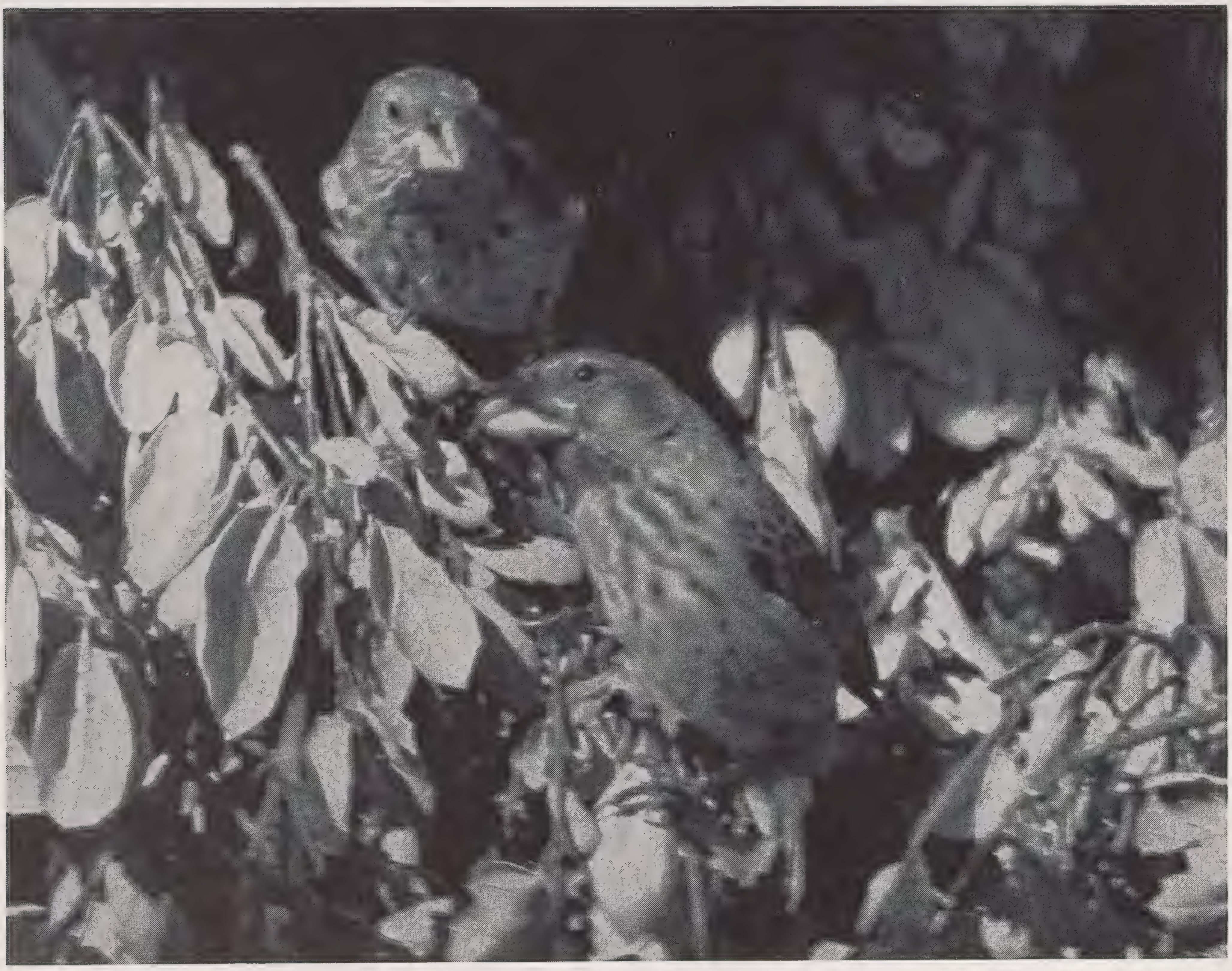
tants of these distant oceanic islands an expedition was sponsored in the latter part of 1938 by the Royal and the Zoological societies of London and the Elmgrant Trustees, Dartington Hall, to go to the Galápagos Islands. Credit is largely due David Lack for the fine results obtained regarding the natural history and behavior of these birds. Furthermore, before leaving, he was successful in securing thirty-one live birds representing four closely related but nevertheless distinctive species.

Originally it had been planned to send these birds to England but on arriving in Panama their condition, due to molting, made it advisable to make their trip as brief as possible. Accordingly, they were sent to the California Academy of Sciences in San Francisco where thirty of them arrived safely on April 28, 1939. Immediately upon arrival they were transferred to the aviaries of Mr. Eric C. Kinsey, who generously cared for them for several months until suitable aviaries were constructed on the roof of one of the Academy's buildings.

The thirty birds surviving the trip consisted of three Large-billed Ground Finches (*Geospiza magnirostris*), four Sturdy Ground Finches (*Geospiza fortis*), twelve Sooty Ground Finches (*Geospiza fuliginosa*), and eleven Gould's Ground Finches (*Geospiza scandens*). Eight of these birds, including three of the four Sturdy Ground Finches, died by the end of the year 1939. The loss of the latter was especially regretted as they represent a species intermediate between the Large-billed and Sooty Ground finches with which it was hoped they might hybridize. The high mortality the first year was attributed to



Cactus pulp is a welcome food to a pair of Sturdy Ground Finches on South Seymour Island. One species uses cactus spines as a probe to extract insects from deep holes — the only known example of a bird using a tool.



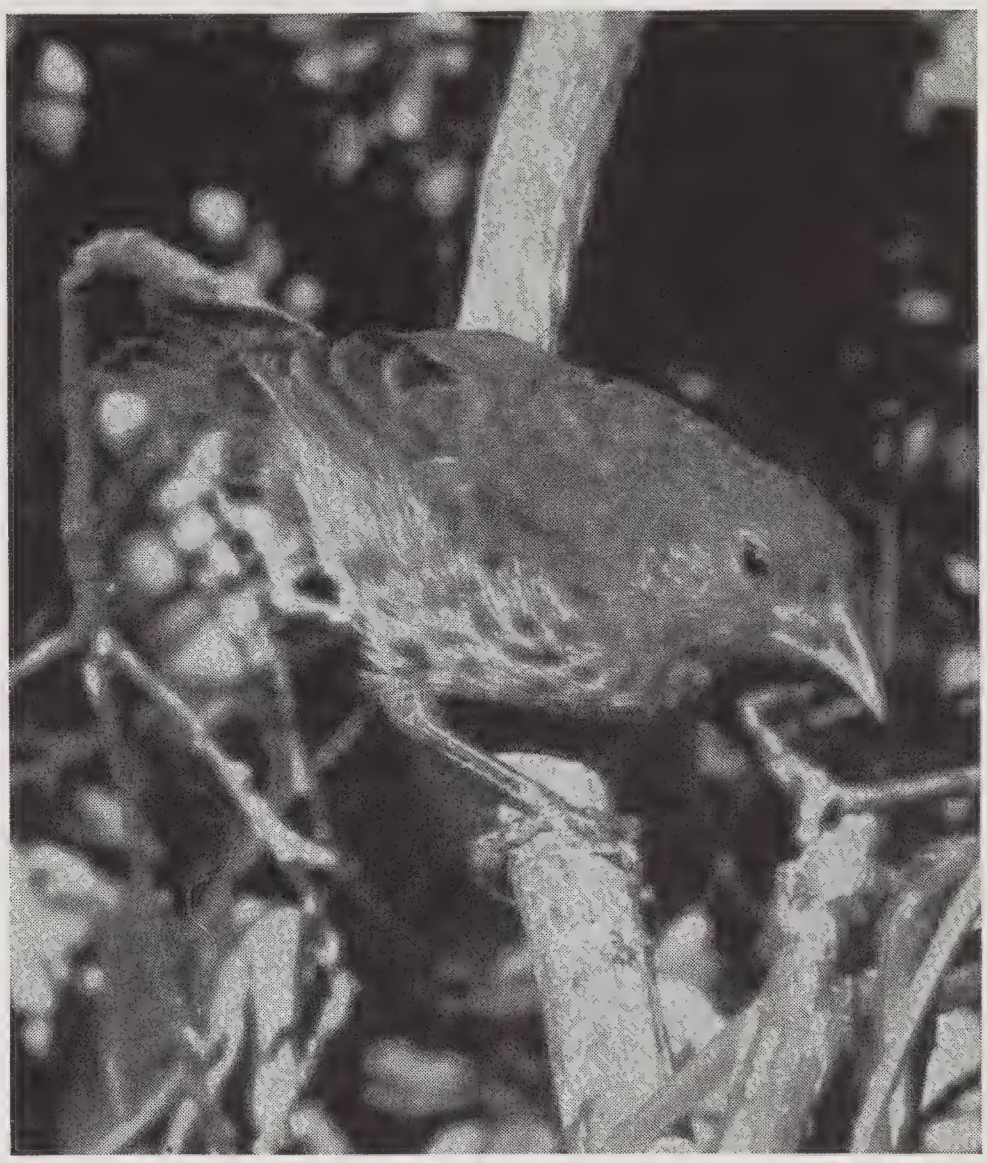
These Large-billed Ground Finches were reared in captivity in California after a collection of these interesting birds was brought back from the islands. The young male (foreground) is still in female-like plumage.

the climatic change, the shifting of the birds to several aviaries and the incompatibility of certain individuals. Probably one feature with which the aviculturist is always impressed and with which he has always to contend yet which is not readily discernable to the field observer is the difference in temperament and disposition of various individual birds of the same species. In this respect they often bear marked resemblance to the human species. This proved to be especially noticeable among the captive ground finches and necessitated much experimentation before compatable pairs and groups could be arranged in various cages. Certain individuals, irrespective of their sex, were very dominant and aggressive, others were timid; some were tame, others very wild; some were possessed of great curiosity while others showed an almost complete lack of interest in their surroundings. Only one loss was incurred in 1940 when considerable success was attained in breeding three of the species (there being only one male Sturdy Ground Finch surviving). Likewise, in 1941 a single loss occurred among the adult birds and so far in 1942 three birds have died. Thus, to date, seventeen of the original thirty still survive. These losses, however, have been offset through the successful rearing of young in captivity.

It may seem strange to some that equatorial birds such as these would thrive so well in the North Temperate Zone. It must be recalled, however, that despite the position of these volcanic islands on the Equator they are for the most part relatively cool and rather arid. The presence of the cold Humboldt Current from the Antarctic in the surrounding sea is responsible for the climate and the scarcity of humid, tropical vegetation.

Aviary studies of these finches, while they never could equal observations made in nature's own out-of-doors laboratory, have thrown considerable light upon certain phases of their natural history, especially regarding courtship and behavior, the growth and development of young and plumage sequence. Many bits of information have been obtained through experimentation that would either be impossible to secure in the wild or would have required months, perhaps years, of diligent field observations.

Early this year with our country at war and the menace of Axis bombing appearing more imminent at that time than since in the San Francisco metropolitan area, it seemed advisable to send a certain proportion of these birds to another part of the country. Accordingly, through mutual agreement between the California Academy of Sciences and the New York Zoological Society, it was arranged to send ten adult Galápagos Finches to the Bronx Zoo where they are presently housed. These birds literally flew from San Francisco to New York in eighteen hours, not of their own accord, however, but as passengers in a TWA plane. It is hoped they will thrive as well on the east coast as they have done in San Francisco on the Pacific.



The bills of the various species of ground finches vary considerably; this one is almost starling-like. The bird is a captive-reared Gould's Ground Finch.

Photo by R. H. Smith,
New Brunswick Govt. Info. Bur.

One of the secrets of our success with moose in the Zoological Park — if success it turns out to be after all these years of effort and failure — will be that the animals were captured young and were hand-reared in their native haunts in Canada, being gradually accustomed to an artificial diet. This is one of the moose that came to us.

Problem Animal: The Moose

After Many Attempts to Exhibit the Largest Member of the Deer Family, the Zoological Park Is Trying Again

WILLIAM BRIDGES

Hunters say that the most impressive sight in the north woods is a magnificent bull moose threshing his way through the underbrush —three-quarters of a ton of lusty flesh and bone wielding shovel-like antlers almost six feet in spread.

It is a sight that has occupied the daydreams, off and on, of the Zoological Park's Mammal Department for more than forty years. Well-wooded and well-watered ranges in the Zoological Park seemed ideal for moose, but somehow the dream never became a reality. Time after time the experiment was tried, but with one exception moose never thrived here and eventually it came to be accepted—grudgingly—that the climate of New York City may be fit for human beings but it definitely is not moose weather.

Now we are trying again.

The legend that moose have an antipathy to the New Zoological Park started even before the Zoo was opened to the public. Our first specimen, a female, came into the collection on October 27, 1899, and there appears to have been difficulty about getting the animal to feed on such hay substitutes for its natural browse that were available here. Nevertheless it survived the winter, barely survived it, but died on April 15, 1900.

Thereafter for half a dozen years moose followed moose in rapid succession. The record cards in the Mammal Department files are brief but eloquent witnesses to the founding of the legend.

"Moose, ♂, arr. Dec. 5, 1900. Died May 31, 1901."

"Moose, ♀, arr. Dec. 20, 1900. Died Dec. 20, 1900."

"Moose, ♂, arr. May 16, 1901. Died Aug. 13, 1901."

"Moose, ♀, arr. dead, Nov. 26, 1901."

The entries are typical of the records for seventeen moose which the Zoological Park exhibited or tried to exhibit between 1899 and 1941. Fourteen of them came and went before the end of 1906 and then there was a period of complete discouragement for twenty years, during which the moose was counted out as an exhibition animal. One moose came in the spring of 1925 and died the following spring; in 1941 we tried again and lost a fine young male moose within three weeks as the result of an accident.

Only one moose, in all those years, really made a record for itself. A bull that came on December 5, 1900, lived and thrived until June 1, 1906.

The situation was so bad that the late Dr. Hornaday, always so enthusiastic and fluent about any new species that came into the collection of the young Zoo, studiously avoided references to the moose in the early issues of the *Bulletin*. In the Guide Book to the Zoological Park that he wrote, he stated flatly that "This densely humid and extremely saline atmosphere [in New York City] is about as deadly to the black-tail, caribou and moose as it is to the Eskimo."

Now we think we know a little more about moose and we have a pretty good idea why they did not thrive in the earlier days.

To be maintained successfully in captivity—even such captivity as ours, where they roam large tracts of two or three acres—moose must be caught young and accustomed gradually to artificial food. Or, if they are adult or young-adult, they must be caught at the end of the summer when they are in the peak of condition and then gradually given new feeding habits so that there is no abrupt shift from their forage in the wild to the un-moose-like fare that a zoological garden in this part of the world must perforce provide.

No such considerations were thought of, apparently, forty years ago and moose were whirled out of the north woods and into the zoo and expected to like it or lump it.

Almost a year ago negotiations were started with the governments of two Canadian departments looking to the capture of two or more young moose. Mayor LaGuardia helped by requesting cooperation, and the Zoological Society conducted a long correspondence as a result of which the Government of New Brunswick, through the Hon. D. W. Griffiths, director of the Bureau of Information and Tourist Travel, presented us with a yearling female moose this fall. The Government of Nova Scotia, through the Hon. Harold Connolly, Minister of Industry and Publicity, presented two other animals—a yearling bull and a 17-months-old female.

All three of them have been hand-reared in Canada since a few weeks after birth. All three have been accustomed to an artificial diet. They arrived in late September and early October in a fat, healthy condition, eating voraciously and as friendly and tame as any wild animals could be.

Near the end of October, after a period of quarantine that is routine for all newcomers, the three moose were liberated in the three-acre North American habitat area just east of the Primate House. They were perfectly at home within an hour, following their keeper about for food and paying no more than a passing, friendly attention to the herd of white-tailed deer that share the habitat with them.

Nor did they boggle at the rations we prepared for them—a mixture containing wheat bran, yellow corn meal, crushed oats, chopped alfalfa, dried beet pulp, cane molasses, linseed oil meal, tomato pomace, dried brewer's yeast, dicalcium phosphate, wheat germ, ground limestone, irradiated yeast and salt.

A diet that has come a long way, surely, from the browse, twigs, leaves of many hardwood trees and, occasionally, grass that they normally eat in the wild. Some browse of birch and maple and willow we are able to cut and give them, but their mainstay is the prepared mixture devised by the Zoological Park's veterinarian.

They are starting life in the Zoological Park under the very best of conditions. If, once more, moose fail to survive a reasonable time in our collection, then the legend that moose are a problem impossible to solve will come back with renewed tenacity.

* * *

Zoologically, the American moose is a close relative of the European elk and should, properly, be called the American elk. That name, however, has been preempted by another member of the deer family—*Cervus canadensis,* the elk or wapiti. Most zoologists have a strong feeling that the common names of animals should bear some resemblance to their zoological relationships, and probably would prefer "European elk" and "American elk" for *Alces alces* and *Alces americana,* respectively.

The word "moose," according to Ernest Thompson Seton (from whose great "Life-histories of Northern Animals" most of the following is taken), is an anglicization of the original Indian name of the animal. "As pronounced in an Indian nose," Mr. Seton remarks, the word comes out *"mong-soa* or *mongswa,* said to mean 'twig-eater.' "

Besides the Old World elk, *Alces alces,* three species and one subspecies are recognized in the New World by Dr. H. E. Anthony in his "Handbook of North American Mammals":

Common, or American Moose: *Alces americana americana.* It ranges from the northern United States, east of the Rockies, north to Hudson Bay and northwest beyond the Arctic Circle.

Shiras Moose: *Alces americana shirasi.* Found in the Yellowstone National Park region of Wyoming, in Montana and Idaho; the limits of its range are unknown.

Lydekker Moose: *Alces columbae.* A rather

Photo by R. H. Smith,
New Brunswick Govt. Info. Bur.

Browsing is the art of feeding on twigs and leaves and bark, and the moose is a master of the art. This young animal — one of the three now in our collection — was caught in the act as he nibbled in a Canadian forest. Deciduous hardwood browse and water plants are summer favorites; many evergreens furnish food in wintertime.

uncertain species, with certain minor differences from the Common or American Moose. Dr. Anthony suggests that it is probably indistinguishable from *americana*.

Alaska Moose: *Alces gigas*. The largest of the moose, found in the Kenai Peninsula.

Although we have once or twice attempted to exhibit the gigantic Alaska moose, most of our specimens, and all three of the current ones, are the so-called American moose, from Canada. Monsters that the Alaskan moose are, in all truth the Canadian species is sufficiently impressive, for an ordinary bull will stand 6 feet at the shoulder and there are records of bulls that were 7 feet 4 inches high. One Alaskan bull towered 7 feet 8 inches at the withers!

The weight that a full-grown bull moose attains has long been a matter of argument. As long as scales are not present, hunters are not hampered in their estimates and their imaginations take full wing. The scarcity of actual weights has kept alive the controversy but it seems fairly well established that few Canadian moose will exceed 1,500 pounds on the hoof. The average is certainly several hundred pounds under that figure.

There was a time when moose ranged through most of New England and in New York state to the Catskills, but they have been generally exterminated in the southern part of their range and the last specimen was killed in the Adirondacks more than 80 years ago—in 1861. The range today extends, roughly, across Canada in a broad belt below Hudson Bay and broadens in the northwest to sweep up into Alaska, with a finger-like projection down into the Rockies.

Those limits of its range are probably reasonably fixed; the moose is not a migrating animal, although it does appear to move in large numbers from one large area to another over a long period of years—hardly a migration in the usual seasonal sense of the word.

Indeed, for considerable periods of its life the moose is content with a very small portion of the earth's surface. The moose "yard," which is often erroneously believed to be a small, hard-packed depression in the snow, walled around by untrampled snow, actually is quite small. It may be less than 50 acres in extent. In such an area a moose family consisting of a bull, a female and one or two offspring, may pass the entire winter, criss-crossing the "yard" with trails to get at their food supply of trees and bushes. Seton thinks that "ordinarily a Moose, especially a cow, passes its life within 10 miles of the spot where it was born."

In the "yard" the moose family stays contentedly until spring, if the food supply holds out and no hunters appear, and with the opening up of the weather the family disperses. In some swampy thicket the cow produces her young—often twins. For a few days only the calf, a dull reddish-brown, unspotted, homely creature, remains hidden and then it begins to follow its mother.

By the second summer he is beginning to be equipped for life in the wild. He gets his first antlers—merely stubs, a few inches long. In his third summer the stubs are longer and are pronged, and then, in succeeding summers, palmation begins and increases until in his seventh or eighth year the antlers are fully developed—magnificent shovels that in the Canadian moose may be nearly six feet across, and in the Alaskan moose have been recorded more than six feet broad.

For three or four years of the moose's life—his prime—there is little change in the grandeur of his antlers and then a gradual decline sets in. But in those few years every sense, every muscle, is at its peak and he is supreme among his kind.

The antlers, incidentally, are grown only by the bull moose. They begin to grow in April and three months later have attained their full development and the velvet is ready to be rubbed off. Once his antlers are hardened and he is in fighting trim, the bull moose is ready to find a mate. He will need his antlers, for conflict with rivals is sure to occur.

In two vivid paragraphs Seton tells the story of this uproarious period in the life of a moose:

"His summer life may have been spent on less than one hundred acres of swamp, but now he sets forth on his travels. Every few miles there is a sort of meeting-place of the sexes—a stretch of open woods—often a hardwood ridge between swamps. To these in turn he goes, nosing the earth and the wind for helpful suggestions. Standing with ears acock at every sound that might have been made by a Moose, and at length believing it to be from one of his own race, he challenges it with a deep, long grunt or a short bellow, and approaches it rapidly, slashing the brush with his horns to impress the other with the fact that he is a well-armed and fearless knight, circling about to try the wind from the stranger, or (if there be no wind) repeating his various calls and beatings of the brushwood.

"There are two usual answers to all this—the long ringing reply of the responsive female or another deep grunt like his own, but varied with some guttural sounds that tell of a savage rival, who also is searching the woods with like object. In the latter case, there may be much grunting and manoeuvering before they actually come together. As they approach they often express their defiance by slashing the brush with their new-grown spears and, when at last they meet and close with a crash, the spread and pointed antlers are at once their bucklers and their spears . . . In these combats the weaker generally saves himself by flight. It is but seldom that one of the knights is killed; yet this happens occasionally; and the battle has sometimes had a doubly fatal termination through the locking of the horns."

By many accounts it appears that moose have a good disposition except in the rutting season—with the proviso that an old bull is likely to be bad-tempered most of the time. Certainly moose that have been hand-reared are friendly enough; we saw examples of their tameness soon after our three youngsters were liberated and newspaper photographers entered their range. Several times, while the photographer was absorbed in getting a picture of one animal, another would stealthily approach him from behind and poke an inquisitive nose into his camera case or his pocket. When that occurred, the photographers always turned out to be less tame than the moose.

Not on the margin of a stream in the Canadian woods, but in the North American habitat area in the Zoological Park, to the east of the Primate House, was this picture taken. Our new moose and the white-tailed deer that share the area are mutually tolerant – if not friends – and the moose even permit the deer to feed out of their boxes.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

HOME FROM VENEZUELA

The Zoological Society's Forty-third Expedition of the Department of Tropical Research has just come to an end. Dr. William Beebe, director, with a staff of three—Jocelyn Crane, Research Zoologist; George Swanson, Artist; and Henry Fleming, Entomologist — left New York for Venezuela on February 12 and returned on September 20, flying both ways on Pan-American planes. Invaluable assistance and support were given by a grant from the Committee for Inter-American Artistic and Intellectual Relations, by the Standard Oil Companies of New Jersey and Venezuela, and by four trustees of the Zoological Society, Laurance Rockefeller, Childs Frick, Herbert L. Satterlee and George C. Clark.

The field work was carried out in the jungles about Caripito, Venezuela. The objects were to conclude life history studies begun some years ago in British Guiana, to secure extensive color motion picture records of wild life, to record the reactions of animals to the very distinct wet and dry seasons, to investigate the night life of jungle organisms, and to make observations through very high power binoculars (12, 20 and 40 diameters).

In the course of the seven months 150 color plates were completed, upwards of 40,000 insects collected, and Miss Crane took 6,000 feet of color motion picture film and made more than 1,000 stills, both black-and-white and colored. The great amount of observational data obtained will be evident in forthcoming technical and popular contributions. Substantial foundations were laid for a future source of supply of living, neotropical vertebrates and invertebrates for the Zoological Park, and a continuous flow of animals suitable for exhibition should be possible when the end of the war again permits safe passage of oil tankers.

Five lectures with motion pictures were given in Caripito and Caracas, and constant, constructive relationships were initiated and maintained with Venezuelan scientists and institutions.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since last issue of this magazine are the following:

Patron
Capt. Jean Delacour
Annual
Mrs. Frederick T. Birchall
Mrs. Arthur Tuckerman
Junior
Henry Tamar

A COURSE FOR TEACHERS

For the second time the Zoological Society expects to offer a course in vertebrate zoology to persons generally interested in animals and particularly to teachers in the New York City schools who may thereby gain two Alertness Credits. The course will be given in the Zoological Park and will be held on twelve successive Saturdays beginning February 6 and concluding on April 24.

Staff members will present lectures and conduct the group on demonstration tours. The schedule includes: General Anatomy of the Vertebrates, Dr. Leonard J. Goss; The Fishes, C. W. Coates; Amphibians and Reptiles, Dr. Ross F. Nigrelli; Birds, Lee S. Crandall; Mammals, Dr. Claude W. Leister.

REINDEER WITHOUT ANTLERS?

As the Christmas season approaches, we are in the slightly embarrassing position of having planned an elaborate holiday display of our reindeer herd — only to find that this year the animals are dropping their antlers well in advance of Christmas! And, since a reindeer without antlers, is even less distinguished-looking than with them, the whole idea will probably have to be dropped.

The herd consists of five reindeer—three females, a male and a baby. One female has a fine set of antlers and another female has a malformed pair—normal on one side and stunted on the other. The two other adults dropped their antlers in mid-November.

Sam Dunton, for many years photographer at the Aquarium, has been engaged as photographer at the Zoological Park to replace William Fitz, Jr., who has gone into war work. It is a stroke of great good fortune to get such a skillful and experienced photographer as Mr. Dunton and the Society's photographic collection of more than 20,000 negatives should receive many important additions through his work.

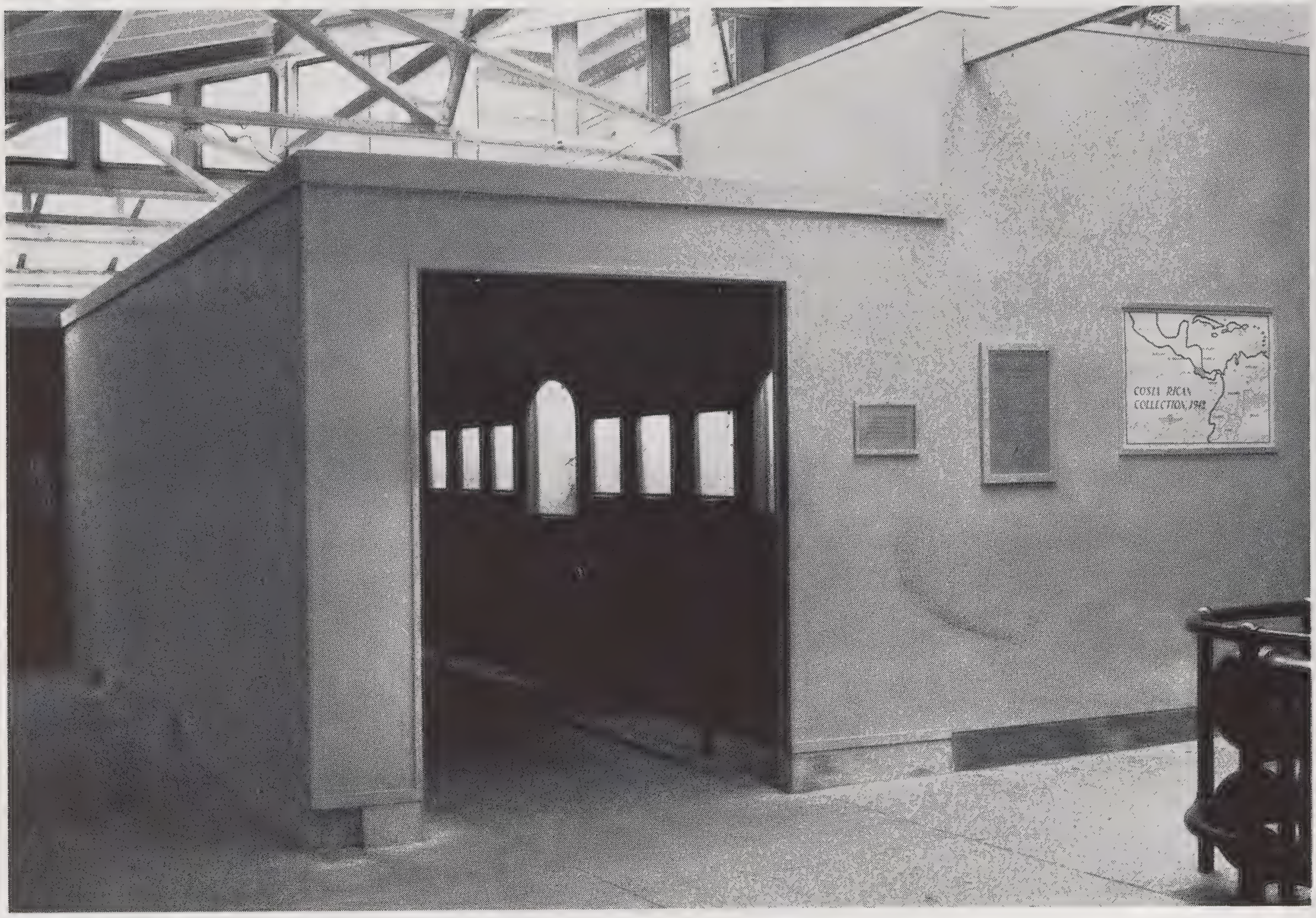
* * *

"The Life and Good Times of the Giant Panda" will be the mid-winter special exhibition at the Heads and Horns Museum Gallery in the Zoological Park — a record in photographs of all the giant pandas that have been exhibited in this country and England, with diagramatic and descriptive material to show why a giant panda, which looks so very much like a bear, actually is more closely related to the raccoons. The exhibition will begin on December 11 and continue through January 31. Our two young giant pandas will, of course, be having their own good times daily in their Tibetan Garden enclosure during the winter and will be outside except on cold, blustering days.

THE "JEWEL ROOM"

Since early November there has been something new under the sun — a new way to display in the full brilliance of their iridescent plumage the "glittering fragments of the rainbow" known as hummingbirds.

A plan to create a dark room for visitors from which they would look into small, brilliantly lighted flowering compartments each containing two or three hummingbirds took shape during the summer when it became apparent that the Zoological Society's collector, Charles Cordier, would be able to return from a Costa Rican collecting trip with a large number of hummers. The "Jewel Room" in the Main Bird House was almost completed when Mr. Cordier arrived on



In the dark interior of this room — the Jewel Room — that occupies a corner of one hall in the Main Bird House, our new collection of Costa Rican hummingbirds is magnificently displayed. Seven small and three larger compartments hold the birds, and each is planted with hardy green plants and freshly blooming flowers.

Perching among luxuriant green foliage and brilliant flowers that must remind them of their native jungles, three Costa Rican Fire-throats set off the beauty of one of the compartments in the new Jewel Room. The Fire-throats live up to their descriptive name; their throats are shimmering crescents of orange flame as they hover.

October 9 with 96 birds, including 52 hummingbirds, 3 specimens of the Umbrella Bird – never before exhibited in a zoological garden – and 18 Costa Rican quetzals, besides 23 other miscellaneous small birds.

The Jewel Room was opened to the public on November 6 after a preview for members of the Society and consuls of nine Latin American countries on November 5. Up to the present the exhibit has proved entirely satisfactory as living quarters for notoriously delicate birds.

A full report on the Cordier expedition and this greatest collection of Central American birds ever to arrive in the United States is being prepared for the January-February issue of ANIMAL KINGDOM.

PUBLICATIONS OF INTEREST

PUBLICATIONS OF INTEREST

THE VERTEBRATE EYE AND ITS ADAPTIVE RADIATION. By Gordon Lynn Walls. Bulletin No. 19 of the Cranbrook Institute of Science, Bloomfield Hills, Mich. 785 pages. $6.50.

This is a heroic undertaking that unquestionably will find wide use. Essentially it is a thoroughly digested collation of all that is known concerning the vertebrate eye, including much original matter. The arrangement is particularly scholarly and clearly reveals the profundity of the author's grasp of his subject. Anyone who is in the least concerned with the behavior and functioning of any vertebrate can scarcely afford to be without ready recourse to this great compendium of data on the morphology, functioning and evolution of this outstandingly important organ of perception.

In the brief space available for this notice it is impossible to discuss in any adequate manner the various special topics and their subdivisions. The treatment is in three major divisions, under the headings Basic, Ecologic and Synoptic. As they indicate, the first discusses the fundamental nature of vision, the second its variations throughout the vertebrates in reference to environmental demands, and the last takes up vertebrates group by group and considers vision from the phylogenetic standpoint.

There is a good bibliography, index and glossary and the very excellent illustrations are profuse. It is an institutional satisfaction to note that Dr. Walls used an Aquarium photograph for his frontispiece. Published by a non-profit organization, it is a large book for the price, and a good one.— C. M. Breder, Jr.

INDEX

Figures in **black type** indicate that the reference is, or includes, an illustration, map or diagram.

A

Adder, puff, 95
Addison, Walter, 47
Administration Building, remodeling, 56
Agyrtrina viridiceps, 29
Air-raid precautions, 31
Albemarle Island, **111**
Alces alces, 148
  americana americana, 148
  americana shirasi, 148
  columbae, 148
  gigas, 149
"All About Elephants," reviewed, 80
Allocotopterus deliciosus, 29
Animal Kingdom, 1
Anolis carolinensis, 88
Antilope cervicapra, 59
Ants, colony of, **41**
  in Sullivan County, 40
Aoudad, **44**
Aquarium, **48**
  exhibits in Lion House, 30, 47
  distribution of old specimens, 50
  laboratory at Palmetto Key, **112**
  mural painting in, **49**
Aquatic flight cage, **118**
Arctictis binturong, 59
Asterocampa celtis, 90
Attendance, upswing in, 56
Atteva aurea, 90
Auchincloss, Douglas, 18

B

Babies, Zoo, 59
  list of spring births, 59
  paradoxure, yellow, 56
  penguin, blackfooted, hatched, 79
Bamboo, 4, 13, 14
Barbet, western Colombian, 29
Barbour, Dr. Thomas, 55
Beebe, William, 30, **130,** 151
  expedition to Venezuela, 30
  "Stoep Studies," 131-37
Binturong, 59
Birds, humming, 24
  regent, 31
  stray, 99
  umbrella, 56, 153
Birds of Paradise, long-tailed, 78
Blackbuck, Indian, 59
Blair, John, 122
"Book of Bays," reviewed, 80
Bransom, Paul, 57
Breder, Charles M., Jr., 50, 112
  book reviews by, 127, 154
Brephos infans, 90
Bridges, William, book review by, 80
  "Flame-in-the-Forest," 24-29
  "It's Nesting Time Again," 75-78
  "Birds Astray," 99-101
  "The Story Behind a Memorandum," 112-114
  "Problem Animal: The Moose," 146-150
Burma, death of, 124
Butterfly, hackberry, 90

C

Caciques, passing laboratory at Caripito, **134**
Cactospiza pallida, 142
Calliste, buff-naped, 29
  Ecuadorian red-headed, 29
  rufous-headed, 29
  rufous throated, 29
  southern emerald, 29
  western golden, 29
Calospiza arthus occidentalis, 29
  florida auriceps, 29
  gyrola nupera, 29
  ruficapilla, 29
  ruficervix ruficervix, 29
  rufigula, 29
Canis latrans, 59
Cape Hunting Dogs, 56, 60
Cardinal, 88

[illegible] 1942

Cavies, Patagonian, acquisition of, 125
Cephalopterus ornatus glabricollis, 56
  ornatus ornatus, 56
  ornatus penduliger, 56
Cervus canadensis, 148
Chaetura pelagica, 125
Chiang, Kai-shek, Madame, 3, **12,** 18
Chengtu, 4
"Children's Zoo," reviewed, 104
Chimney Swift, 125
Chlorophanes spiza subtropicalis, 29
Chlorostilbon melanorhynchus, 29
Chungking, 4
Citizens, of the jungle, **138, 139, 140, 141**
Civet, masked palm, 59
Clark, George C., 151
Coates, Christopher W., 151
  "Pisces in Leo," 47-50
Cobra, hood of, 95
  king, 97
  spitting, 71
  venom, 71
  water-dwelling, 96
Cock-of-the-Rock, Scarlet, 24, **25,** 29
Colias eurytheme, 90
  philodice, 90
Colichotis magellanica, 125
Compsocoma flavinucha cyanoptera, 29
  flavinucha victorini, 29
Connecticut, animal life in, 85
Connolly, Hon. Harold, 147
Cordier, Charles, 24, **25,** 102, 152
  sails for Costa Rica, 56
County, Sullivan, 40
Cox, Dr. Richard T., 113
Coyote, 59
Crane, Miss Jocelyn, 30, 151
Crandall, Lee S., 24, 99, 123, 151
  book reviews by, 32, 127
Cyanolesbia coelestis coelestis, 29

D

Delacour, Jean, 25
  "Gibbons – the Smallest Apes," 35-39
  "Fifteen Years with Indo-Chinese Birds. II," 107-108
Department of Tropical Research, work in Venezuela, 30, 151
Didelphis virginiana, 85
Ditmars, Raymond L., **82**
  "The Frogs of Paradox Pond," 51-55
  In Memoriam, 83
Dontzin, Ben, 113
Duck, mallard, **77**
    nest on Lion Island, 75
    young on Lion Island, 125
  wild, in Park, 31
  wood, 76
Dunton, Sam, 152

E

Eagle, American golden, **67, 68, 69, 70**
Eisendrath, David B., Jr., 105
  photographs by, **115, 116, 117, 118**
Elephant, death of baby, 124
"Elephant Tales," reviewed, 32
Elk, herd in Zoological Park, 124
Eubucco bourcieri occidentalis, 29
Eugenia imperatrix, 29
Ezra, Alfred, 76

F

"Fading Trails," reviewed, 127
Farm-in-the-Zoo, 81, 103, **103**
Felis leo, 59
Finch, Cocos Island, 142
  Darwin's, 142
  ground, Gould's, 143, **145**
    large-billed, 143, **144**
    sooty, 143
    sturdy, 143, **144**
Fitz, William Jr., 152
Flamingoes, American, gift of, 123
Fleming, Henry, 30, 151
Formica exsectoides, 40
Foxes, red, baby, **Cover No. 3,** 59
Frick, Childs, 151
Frog, leaping, **117**
  paradox, 51, **54, 55**

G

Galápagos Islands, 105, 109, **111**
Garman, Professor Samuel, 55
Garrulax leucolophus, 39
Geospiza fortis, 143
  fuliginosa, 143
  magnirostris, 143
  scandens, 143
Gibbons, **34, 37, 38**
  at Clères, 35, 39
  Cover No. 2
  Indo-chinese and baby, **36**
  hoolock, 39
  lar, 39
  on "Monkey Island," 35
Goat, Rocky Mountain, **43**
Gordon, Dr. Myron, 50
Goss, Leonard J., 125, 151
  "How Are the Giant Pandas?", 120-122
Graham, Dr. David C., 1, 7
  "How the Baby Pandas Were Captured," 19-24
Griffiths, Hon. D. W., 147
Gudger, Dr. E. W., "Physalia, the Fish-eater," 62-66

H

Harkness, Mrs. Ruth, 19
Heath, Millward W., 123
Heavenly Sylph, 24, 29
Helianthea wilsoni, 29
Hierophasis imperalis, 108
Howes, Paul Griswold, 81
  "Strangers in Our Midst," 85-90
Hummingbirds, **152, 153**
  Costa Rican, 152
  emerald, black-billed, 29
    green-headed, 29
  Empress Eugenie's, 29
  fire-throat, **153**
  white-tip, **27,** 29
Hylobates syndactylus, 39

I

Ibex, Spanish, **45**
Indo-China, 107
Insect, wax, Venezuelan, **139**

J

Jabouille, P., 107
Jacoby, Melville, 18
  Mrs. (Annalee Whitmore), 18
Jennings, Allyn R., 16, 31
Jewel Room, Hummingbird, 152, **152**
Joseph, Ellis S., 31, 127
Jungle, at Caripito, **135**

K

Kazimiroff, Theodore, 40
  "Empire of the Ants," 40-42
Kinsey, Eric C., 143
Klipspringer, 59, **60**
Kung, Dr. H. H., 4, 18
  Madame, 3, **12**

L

Laboratory, at Caripito, **137**
Lack, David, 143
LaGuardia, Mayor, 147
Lar, 39
Leister, Ann, book review by, 104
Leister, Claude W., 124, 151
  book reviews by, 32, 80, 104, 127
  "Zoo Babies," 59-61
"Lionarium," 47, **48**
Lioness, cub, **115**
Lions, born in Park, 59
Lignum Vitae Island, giant tortoises on, 110
Lizards, devouring butterflies, **140**
  fence, 88, **89**
Luce, Mrs. Henry, 18
Lycaon pictus, 59
Lycopodia, 40

M

Mamba, green, 72
Mammals, small, on Snake Island, 124
Manakin, club-winged, 29
"Man and the Vertebrates," reviewed, 127
Mantis, praying, 88, **89**
Marcy, Donald, 123

Markhor, Suliman, **46**
Mathewson, Robert, "Questions Everybody Asks About Snakes, I," 71-75; II, 95-98
Meaunier, Rev. Father, 107
Mei Shan, prayers to, **21**
Members, new, 30, 56, 102, 123, 151
Metacumbe Island 110
Moccasin, cottonmouth, 72
Moose, **146, 148, 150**
  Alaska, 149
  American, 148
  Lydekker, 148
  problem animal, 146
  Shiras, 148
  weight, 149
Moth, in Connecticut, 90

N

Nariva Swamp, 51
Needlefish, **113**
  transport of eggs to New York, 114
"Nellie," griffon vulture, 104, **126**
Nigrelli, Ross F., 151

O

Ocreatus underwoodi underwoodi, 29
Octopus, guarding eggs, **91, 92, 93, 94**
"On Growth and Form," reviewed, 127
Opossum, mouse, **141**
  Virginia, 85, **86**
Oreotragus o. oreotragus, 59
Orr, Robert T., "Darwin's Finches," 142-145
Osborn, Fairfield, 103, 151
  editorials by, 1, 33, 57, 81, 105
  tribute to Raymond L. Ditmars, 83, 84

P

"Pageant in the Sky," reviewed, 32
Paguma larvata, 59
Palmetto Key, Aquarium laboratory at, **112**
Pandas, giant, **2, 6-9, 13, 15, 16**
  Cover No. 1
  exhibition on, 152
  first discovery, 19
  habitat enclosure for, **18**
  hunters, employed by Dr. Graham, **20**
  journey to New York, 3
  passport for, **10**
  prohibition on killing, 19
  questions and answers concerning, 16, 17
  up a tree, **79**
  weight, 3, 122
Pandora, giant panda, 20
Paradox Pond, 52
Paradoxure, yellow, birth of, 56
Pay-day, new, 30
Penguin, black-footed, hatched, 79
Pheasants, Edwards', 107
  imperial, **106**
  kaleege, 108
Physalia, 62, **63, 65**
Pinaroloxias inornatus, 142
Piranga flava desidiosa, 29
Plains, at Caripito, **132**
Polytrichium commune, 42
"Prairie Dog Town," reviewed, 104
Price, Dr. Frank, 18, 23
Procyon lotor, 59
Pseudis paradoxus, 51
Python, 95
  regal, 96

Q

Quetzals, Costa Rican, 153

R

Raccoons, young, **58,** 59
Racket-tail, white-footed, 24, **28,** 29
Ramphocelus dimidiatus dimidiatus, 29
  flammigerus, 29
  icteronotus, 29
Rangifer tarandus, 59
Rappe, Dr. Bertram, 10
Rattlesnake, 72
  meat, 98
  prairie, 73
Ravens, nest-building, 56, 78
Reindeer, 59, **61,** 151
  Cover No. 6
Renauld, Rev. Father, 107
Richmondena cardinalis cardinalis, 88
Rockefeller, Laurence S., 151
Rubicam, Raymond, 18
Rupicola peruviana sanguinolenta, 29

S

Sage, Dean, Jr., 19
Sandpiper, semipalmated, 124
  solitary, 124
Satterlee, Herbert, 131, 151
Sericulus chrysocephalus, 31
Sheep, Barbary, **44**
Siamang, 39
Snail, giant, in Venezuelan jungle, **138**
Snake, black, 74
  coachwhip, 97
  flying, 74
  garter, 72
  "glass," 73
  green, keeled, 74
    smooth, 74
  hoop, or horn, 95
  "joint," 96
  king, 74
  milk, 95
  water, green, 72
Snakes, questions and answers about, 71, 95
Snake Island, mammals on, 124
South Seymour Island, **143**
Stacey, Sam, 25
Stoep, Caripito laboratory, **130**
Strongylura notata, 112
Stuart, Dr. Charles E., 18
Sugar-birds, Colombian green, 29
Swanson, George, 30, 151
Sweeny, Harry, Jr., 4, 31
Swift, Otis, 18

T

Tanager, blue-winged mountain, 29
  Colombian red, 29
  crimson-backed silver-beaked, 29
  green-backed mountain, 29
  orange-rumped, 29
  yellow-rumped, 29
Tapir, South American, 123
Tapirus terrestris, 123
Teachers' Course, 31, 151
Tee-Van, John, **7, 12, 15**
  "Two Pandas – China's Gift to America," 3-18
  appointed Acting Curator of Reptiles, 102
Tee-Van, Mrs. Helen Damrosch, 47
  Aquarium mural painted by, **49**
Tenodera sinensis, 88
Thalurania fannyi verticeps, 29
Tong, Dr. Hollington K., 4, 18
Tortoises, Giant, 109, **109, 110**
Totem Pole, removed, 79
Townsend, Charles H., "Can We Save the Giant Tortoise?" 109-111
Tsang, Governor, 23
Ts'ao P'o, prayer ceremony at, 22

U

Umbrella Bird, 56, 153
"Umbrella Bird Camp," 102
United China Relief, 3, 18
Urosticte benjamini benjamini, 29
Useppa Flats, 113

V

VanderPyl, Miss Mary, 30
"Vertebrate Eye and Its Adaptive Radiation, The," reviewed, 154
Vipera vipera, 97
Vulpes fulva, 59
Vulture, black turkey, 87, **87**
  griffon "Nellie," 104, **126**

W

Wapiti, **Cover No. 5**
  Zoological Park herd, 124
Wei-han, Den, 19
West China Union University, **5**
"What's New at the Zoo?", 31
Wood Nymph, green-headed, 24, 29

Y

Yellowlegs, lesser, 124

Z

Zebra, mother and son, **116**
Zoologica, papers to be listed in "Animal Kingdom," 104

BOOK BARGAINS

Publications of the New York Zoological Society

Offered at Savings of 50¢ to $1.50

THE AMERICAN BISON

By Martin S. Garretson

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for the first accounts of its appearance and habits, pictures its wide range and incredible numbers. It sets forth authentically the natural history of the animal, describes the tragic course of extermination that ranged unchecked until there were only 1,091 bison left in the whole of North America, and then it tells of the rise and development of a strong national sentiment that saved the species from extinction. *254 pages, 65 illustrations.*

Was $2.50 . . . . . Now $1.50

PETS AND HOW TO CARE FOR THEM

By Lee S. Crandall

As Curator of Birds in the New York Zoological Park, Mr. Crandall has responsibility for the diet, health, cage conditions and general well-being of some 2,000 birds of many species. Out of his experience with the Zoological Park's collection and a life-long enthusiasm for pets of every kind, he has written a completely authoritative and practical book on pets and their maintenance in good health. He devotes individual chapters to Dogs, Cats, Domestic Rabbits, Small Wild Animals, the General Care of Birds; Pheasants, Peafowl and Guineafowl and Quail, Waterfowl, Parrots, Cage Birds, Canaries, Domestic Pigeons, the General Care of Fishes and Aquarium Fishes. *296 pages, 96 illustrations.*

Was $2.00 . . . . . Now $1.00

PRESENT DAY MAMMALS

By Claude W. Leister

Students in Zoology and Biology classes and the general reader who has often been puzzled by the relationship of animal groups will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. It answers such questions about mammals as: What does it look like? How big is it? To what is it related, and why? Whence does it come? Typical representatives of every Order of mammals are pictured here, accompanied by a clear text explaining the zoological status of the animals. *74 pages, 106 illustrations.*

Was $1.00 . . . . . Now 50 cents

Order from:

Department B, Zoological Park, Bronx Park, New York City

(Make checks payable to New York Zoological Society)

NEW YORK ZOOLOGICAL SOCIETY

ANIMAL KINGDOM

NEW YORK ZOOLOGICAL SOCIETY

VOLUME XLVI
JANUARY TO DECEMBER, 1943
NUMBERS 1–6

Smithsonian Institution
U. S. National Museum

INSTRUCTIONS TO BINDER

The 4-page signature forming the first 2 and the last 2 pages of this issue may be inserted ahead of the cover of Vol. XLVI, No. 1, in binding the Volume.

CONTENTS

No. 1. JANUARY – FEBRUARY

The Umbrella Bird Comes to the Zoo . . . . *Charles Cordier* 3

Fins . . . . *Pictures* 11

Pride of the Antelope House . . . . *Claude W. Leister* 15

Black Lace for the Gold Platyfish . . . . *Myron Gordon* 18

Behind the Scenes: News and Notes 21

No. 2. MARCH – APRIL

Cashing Jungle Dividends

Part 1: General . . . . *William Beebe* 27

Part 2: Specific . . . . *Jocelyn Crane* 30

Portraits of Four Primates . . . . *Pictures* 35

Homing Pigeons in Peace and War . . . . . . *Lee S. Crandall* 39

Newest Animal – the Kouprey . . . . *William Bridges* 43

Behind the Scenes: News and Notes 45

No. 3. MAY – JUNE

Apotheosis of the Zoo . . . . *William Beebe* 50

Ten Ways of Helping Baby Birds . . . . *Lee S. Crandall* 56

Alas, Poor Annie! . . . . *William Bridges* 58

Portraits of Four Primates. II. . . . . *Pictures* 59

Before Montefiore Joash Sunshine . . . . *Claude W. Leister* 63

Behind the Scenes: News and Notes 71

No. 4. JULY – AUGUST

Bears and Their Curious Ways . . . . *Donald Marcy* 75

What We Have Learned About Blind Cave Fish . . . *William Bridges* 82

Portraits of Four Primates. III. . . . . *Pictures* 83

"Lightning-bugs" . . . . *Henry Fleming* 91

Behind the Scenes: News and Notes 96

No. 5. SEPTEMBER – OCTOBER

Night Life of the Bush Baby . . . . *Donald Marcy* 99
Quetzals *Do* Breed in Captivity . . . . *Charles Cordier* 104
Portraits of Four Primates. IV. . . . . *Pictures* 107
Our Zoo's Former Inhabitants . . . . *William Beebe* 111
Behind the Scenes: News and Notes 119

No. 6. NOVEMBER – DECEMBER

Two Healthy Baby Gorillas . . . . *Claude W. Leister* 123
Winter Get-Together: Fish Aggregations 129
Chipmunk Secrets . . . . *Elsa G. Allen* 133
Behind the Scenes: News and Notes 141
Index to Volume XLVI 143

XLVI • No. 1 JANUARY–FEBRUARY 1943

ANIMAL KINGDOM

BULLETIN, PUBLISHED BY THE
NEW YORK ZOOLOGICAL SOCIETY

LECTOR'S OWN STORY OF UMBRELLA BIRD • WHAT WE HAVE LEARNED ABOUT
BONGO AND OKAPI, *by Claude W. Leister* • HAPPENINGS AT THE ZOOLOGICAL PARK

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field
De Forest Grant
Warren Kinney
William De Forest Manice
David H. McAlpin
Robert Moses
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1943

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert I. Gannon
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Eugene Holman
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van . . . . *Executive Secretary*
Jean Delacour . . . . *Technical Adviser*
William Bridges . . *Editor & Curator, Publications*
C. J. McGahey . . . . *Comptroller*
Claude W. Leister . . . . *Curator, Education*
Donald Marcy . . . . . *Associate, Education*
Millward W. Heath . . . *Supt., Construction & Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*
Claude W. Leister . . . . *Associate, Mammals*
John Tee-Van . . . . . . *Associate, Reptiles*
Leonard J. Goss . . . . *Veterinarian*
Harry C. Raven . . . . . *Associate, Anatomy*
Grace Davall . . . . *Assistant to General Curator*
W. Reid Blair . . . . *Director Emeritus*
William Beebe . . . . *Honorary Curator, Birds*

AQUARIUM

Charles M. Breder, Jr. . . . . *Director*
Christopher W. Coates . . . . . . *Aquarist*
Ross F. Nigrelli . . . . *Pathologist*
Myron Gordon . *Research Associate in Genetics*
George M. Smith . *Research Associate in Pathology*
Homer W. Smith . *Research Associate in Physiology*
Charles H. Townsend . . . . *Director Emeritus*

DEPARTMENT OF TROPICAL RESEARCH
William Beebe, *Director*

Jocelyn Crane . . . . . *Research Zoologist*
Henry Fleming . . . . *Entomologist*
George Swanson . . . . *Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVI FEBRUARY 4, 1943 No. 1

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York, N. Y. Title registered with United States Patent Office.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

GOALS

In his address at our Annual Meeting this year, Dr. Alan Gregg, Director of the Medical Sciences of the Rockefeller Foundation, stated a vital creed. He said in part:

> ". . . let us trust more to our instinctive interest in living creatures. Obviously it is preaching to the converted to urge this audience to a deeper faith in the protection and study of things that live and move and have their being. But if we will still more boldly trust our intuitive beliefs that all creation is alive with secrets and with wisdom, then there is a chance – and for me the only chance – that man can come to see God through His works. . . . The knowledge of living things –Biology – offers more of value now and in the centuries to come to bewildered humanity than any other science. No gift within the power of Nature to confer could possibly be equal to the gift of understanding her."

Years ago a chemist – none other than Dr. Eliot, late President of Harvard University, expressed the same thoughts in different words:

> "The human race has more and greater benefits to expect from the successful cultivation of the sciences which deal with living things than from all the other sciences put together."

These are statements which we profoundly believe in. It is inspiring when men eminent in other fields of science share these beliefs and express them so powerfully. When will the day come when everyone will not only accept the truth of these statements but actually begin to apply them in planning for a better civilization? Too bad if that day is too long delayed!

Fairfield Osborn

FEB - 8 1943

SHOP TALK

There is room in this magazine for everybody to have his say except the Editor. This is very bad for the Editor – makes him feel mistreated, and if long continued is likely to make him fretful and misanthropic.

Humane to a fault, our Editorial Committee has allotted this corner of a page, this little plot of ground, to the Editor. It is his own personal Victory Garden and if nothing comes up but weeds – well, maybe he likes weeds!

●

Just a year ago Frank Rizzi laid down his composing stick in our label printshop and volunteered in the Air Corps. We heard vaguely he was in the West, learning to be a bombardier in a Flying Fortress. Now comes a V-mail letter from Frank, somewhere in Australia. He couldn't say much, except that he was doing a lot of flying. "Our squad saw a newsreel the other night, and it showed the Children's Zoo," he wrote. "Gosh! For the first time I felt as if I were a long, long way from home. Did the baby Kangaroo grow up, and is the Lamb still as fat as ever?"

●

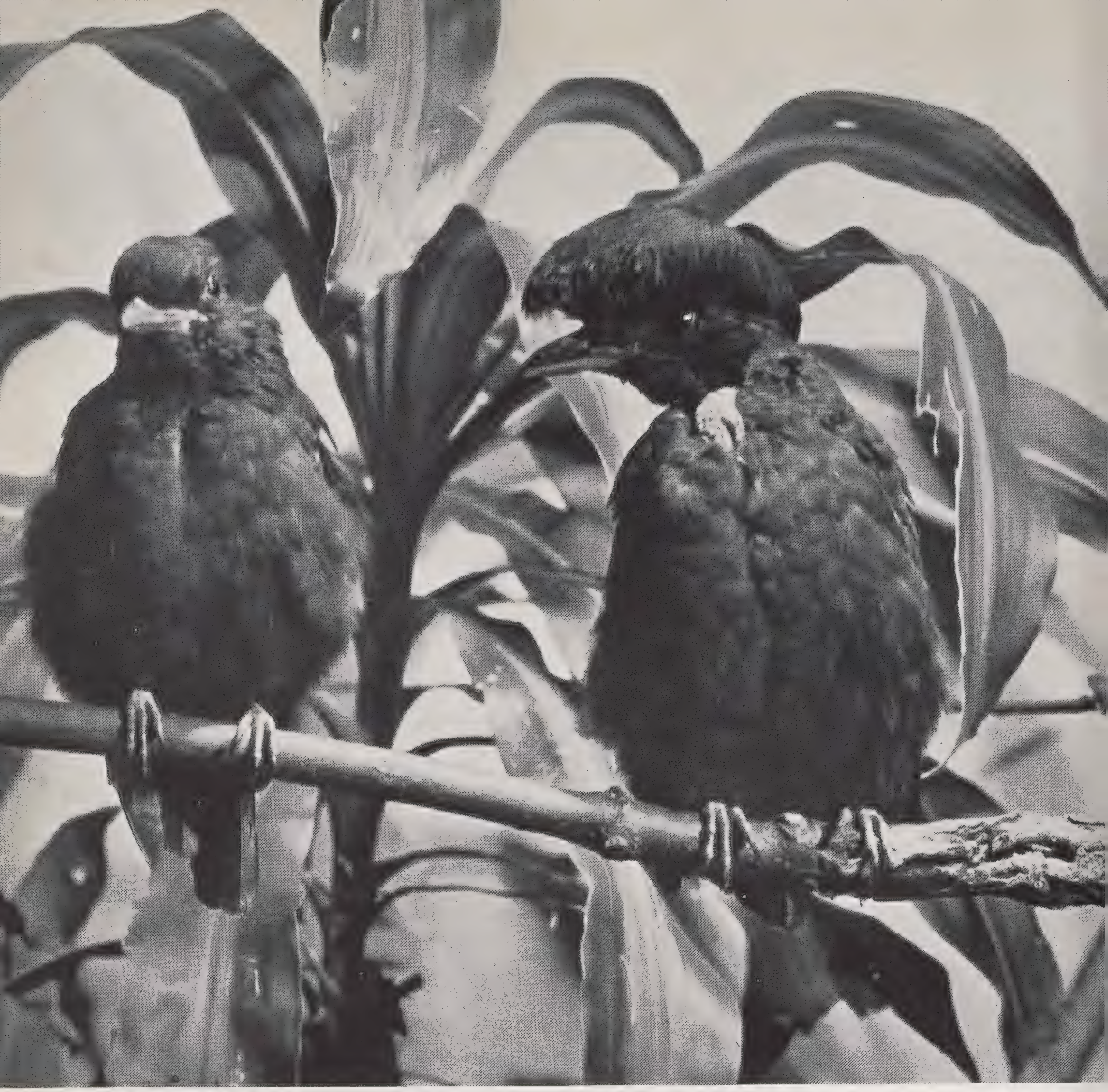
Sidelight on Charles Cordier's expedition to collect Umbrella Birds: the day he broke camp in the interior of Costa Rica, he found on his cot, under his sleeping bag, a paper-flat Coral Snake. "It must have fallen out of the roof and I rolled on it in the night," Cordier explained. "It was a nice little specimen, too."

●

Speaking of snakes, a keeper tossed a frozen Coral Snake on Dr. Goss's autopsy table the other day. "Dead on arrival," he reported. "I'll take a look at it after lunch," Goss said – but after lunch the Coral Snake was taking a look at him! It had thawed out and was ready to bite any and all comers.

IN THIS ISSUE

"Explosion of Fins"– The Zebra Fish . . . . COVER
The Umbrella Bird Comes to the Zoo . . . . *Charles Cordier* 3
Fins . . . . *Pictures* 11
Pride of the Antelope House . . . . *Claude W. Leister* 15
Black Lace for the Gold Platyfish . . . . *Myron Gordon* 18
Behind the Scenes: News and Notes 21



The first Umbrella Birds (*Cephalopterus ornatus glabricollis*) ever exhibited in a Zoological Garden. This is a pair – the male, at the right, with his "umbrella" partly lowered, the top-knot-less female at the left. Several times a day, apparently when he is feeling particularly good, the male lowers and spreads his crest until it hides his eyes and most of his beak. The bare patch of skin on his throat can easily be seen; this is the airsack that the bird inflates "to the size of a big tomato," according to collector Cordier, when making his strange booming noise. We have not yet heard the bird make the noise in captivity.

The Umbrella Bird Comes to the Zoo

For the First Time Anywhere, We Exhibit One of the Curiosities of Central American Avian Life

CHARLES CORDIER

Collector for the New York Zoological Society

When I left New York early in March of last year, three months after bringing back a collection of Colombian birds[1], at the top of my list of "wanted" specimens was a bird that apparently was to be found only in books of ornithology. No zoological garden, at any rate, had ever managed to exhibit an Umbrella Bird (*Cephalopterus ornatus*), although one specimen lived for a time in a private aviary in England.

Costa Rica and western Panama was the habitat of the form known as *glabricollis*; all the books told that much. But they had little else to say that would be useful to a collector and I knew that if I managed to get out with even one Umbrella Bird, it would mean a great deal of hard work or else a great deal of extraordinary luck. As it turned out, it meant hard work.

My search for the Umbrella Bird started in San José with a search for information. In the first few days after my arrival I ferreted out all the retired field collectors whose work had helped M. A. Carriker, Jr., to compile his excellent volume on Costa Rican ornithology. I found one collector with many years of residence in the republic, and he was not encouraging when he told me that on his innumerable field trips he met *Cephalopterus* only once or twice. The other collectors said the same thing. At the little Museum of Natural History in San José I could get no information at all. Reference books simply stated that "The Umbrella Bird is to be found from sea level up to over 10,000 feet on the Atlantic side and is everywhere rare." Just that!

So I got hold of a large-scale map and selected that portion of Costa Rica which looked most untouched—a region with barely a suggestion of a trail. I reasoned that the Umbrella Bird, being rather big and dumb, and consequently an easy prey to hunters, could only hold its own in sparsely settled country.

Incidentally, while making inquiries and packing supplies, I had the good fortune to meet a charming old lady, the widow of the great Costa Rican ornithologist Zeledon. And in the enormous aviary that covered the whole patio of her villa I saw a pair of magnificent Costa Rican Quetzals, the male trailing behind in his flight a tail almost a yard long.

I admired the birds greatly and the proud proprietor of the aviary told me of her astonishing results in breeding these birds. She had actually obtained fully-grown youngsters from the pair.

As I was leaving the villa I remarked that the Bronx Zoo would certainly like to have that pair on exhibition, and then I got the unexpected reply:

"Well, I am getting on in years and this place is too big and I shall have to give it up soon. You can have the birds. Come again some other time and tell me what you will pay for them."

Later we made a deal, the birds to become mine in case they should not try to breed. Fortunately for me, they did not, because the nesting log was not to their liking. And so that pair of Quetzals is now in the Zoological Park, adorning the Tropical American Rain Forest habitat cage.

---

[1] *Animal Kingdom*, Vol. XLV, No. 1, 1942.

FEB -8 1943

On March 28, at 4 o'clock in the morning, the quest of the Umbrella Bird officially began. Our party consisted of myself, a young fellow whose boasts of being a great hunter and bird man had somehow ensnared me into hiring him, and another young fellow who was travelling in the same direction and who had invited us to stay at his cattle farm.

We piled our equipment and ourselves into two taxicabs and in the dark hours before dawn were whisked over excellent but narrow roads in a northwestern direction toward the great Central Plateau. Beyond the settlement of Zapote, at 6,000 feet, the usefulness of the mechanized equipment came to an end. We simply staked our things at the roadside and our helpers started discreet inquiries about getting sturdier and more reliable means of transportation—by which is meant Costa Rica's famed, often gaily painted and intricately ornamented, oxcart, the backbone of the country's transportation system.

Finally they located a prospect and from a distance I overhead the lengthy dickerings.

Proprietor of the oxcart: "Last time when I carried a load of 1,600 pounds to a place much closer, I was paid 15 colones (about $3)."

My helper: "For a load of only 400 pounds (a slight understatement) to a spot only half an hour further on (in strict fact, about 2 hours) we will pay you 10 colones."

Proprietor: "Yes, but think how much more I could get if the cart were fully loaded."

Helper: "All right, if you insist, we can make up a full load by piling on stones."

That rather silly argument clinched the deal.

After a descent of half an hour, a magnificent view began to unfold. Behind were depressingly naked and parched brown fields and pastures, but away down to the north and as far as the eye could reach was an immense expanse of land covered with dense, primitive forest except that part reaching from the foot of the slope we were on to the river San Carlos—some ten miles of flat country converted into pastures. To the left, the view was limited by the mountain chains of the continental divide, also densely wooded, with many rounded ridges projecting at right angles. From distance to distance some higher cone, some extinct volcano, stood out. Nowhere was there a sign of human habitation or traces of clearings, and it needed very little imagination to figure out how tough the going would be in exploring such country.

Late in the afternoon we reached the banks of the San Carlos and the tumbledown ranch-house, roofed with undulating zinc sheets, that was to be our headquarters for a while.

We started spreading the news to the few cattlehands and homesteaders living nearby of the wonderful opportunities offered by disclosing the whereabouts of the *Pavoncillo*—the "little peacock"—a bird half the size of a vulture, with a big crest, all black, with a naked red throat from which hung a piglet's tail with four or five feathers on the end of it. Such was our description of *Cephalopterus ornatus glabricollis*.

We seemed to have stumbled into great luck. Everybody beamed, and knew the bird very well. A bit rare, perhaps, very hard to see, but turning up when one least expected it.

"Why, only the other day I shot one," one fellow told us.

"What day was that?"—eagerly.

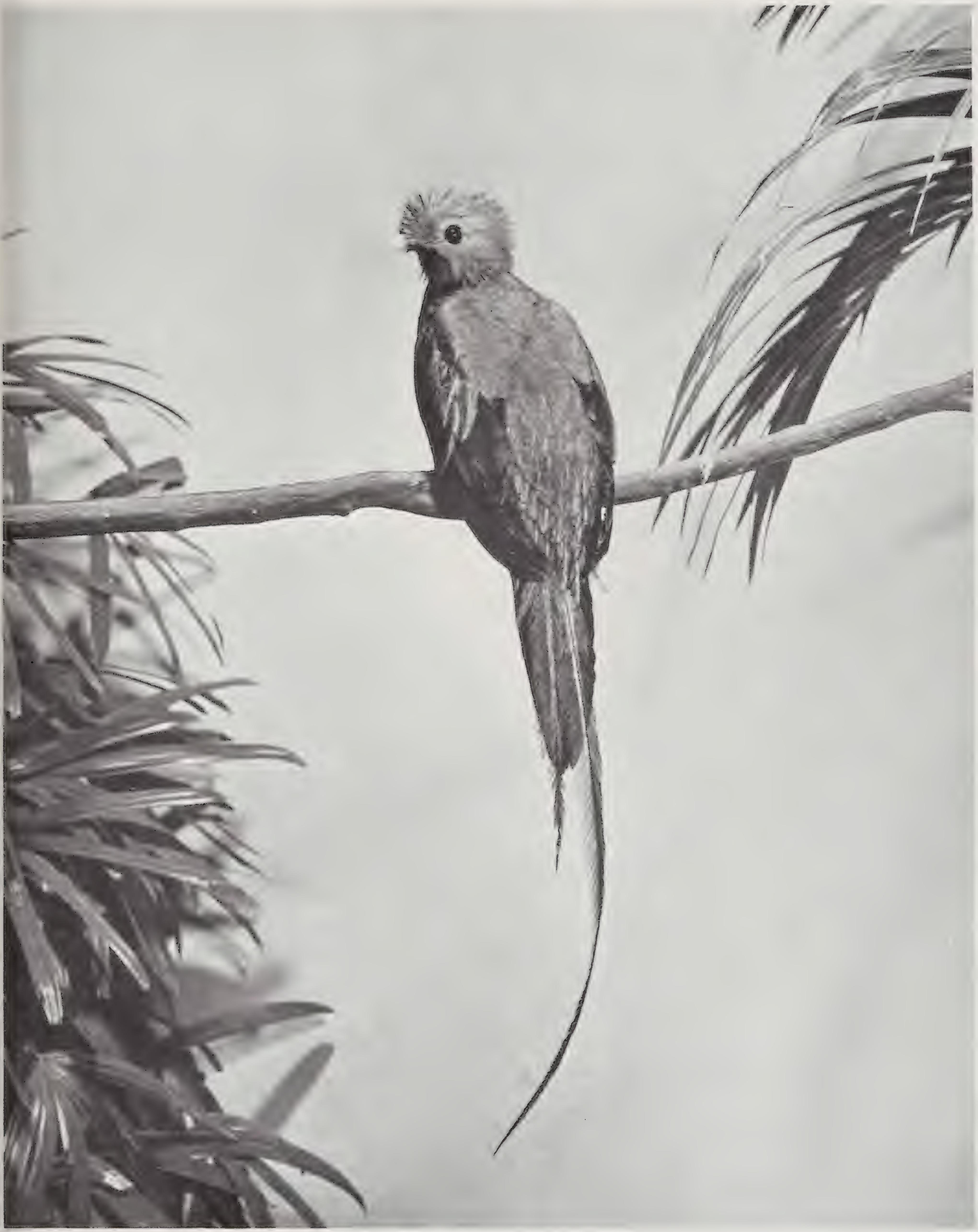
"Well . . . let's see . . . I came here two and a half years ago. It was after the first crop of beans I harvested. Come to think of it, that was the first and last time I saw the *pavoncillo*. But my brother who lives two days further north does practically nothing but hunt, and he knows the bird very well."

I have often thought about the eagerness of natives to tell strangers a pleasing story. To them, apparently, the whole quest makes no sense at all and they think it good to let the truth dawn on the stranger's mind by degrees. Besides, if he stays longer he is bound to spend some money—foreigners are simply rotten with it—and some of it may come their way.

The seeing of one bird becomes, in the telling, many. Seeing two birds transforms itself into a *manada*—a drove. And if there were more than two or three, why, there were simply as many as there are no-account women. . .

For the next fortnight I was busy combing that low-lying territory in all directions. I ranged as far north as the River Arenal some 25 miles distant, with the young man at whose ranch we were staying as my guide. As often as not he got lost.

One day, while jumping from an overhanging



For such a magnificently beautiful bird, the Quetzal (*Pharomachrus mocinno costaricensis*) has a singularly unfinished look about the head. Its blue-green-gold feathers are always tousled and in disarray. But its frowsiness can be forgiven, for there is no bird in the Americas that can equal the splendor of its back and particularly the long, trailing upper tail coverts that show so well in this picture. As our best-plumed specimen – with one tail covert almost 12 inches long – flits swiftly through the shadowy foliage of our Tropical American Rain Forest habitat cage, stray shafts of sunlight bring out the full iridescence of the feathers.

bank to the edge of a river below, one foot shot out from under me and I landed with my whole weight on the other leg doubled under me. I felt an exquisite pain, but soon after could walk almost as well as before. That happened early in the day and after lunch I was unable to get up for some time, but I finally managed to reach a brook where allegedly, only a few days before, two boys had met a pair of "little peacocks" and had chased them with bow and arrow, the birds flying from branch to branch, then from tree to tree, always keeping rather low.

But it was no use; I was unlucky and there was no seeing the birds. Unluckier still, after I explored the brook my leg hurt so that I could go no further.

I finally managed to get on a horse and a native offered to take me to an old woman who was wonderful at healing such things. I agreed readily enough. Already a fortnight had gone by without a trace of the Umbrella Bird; in another two weeks the heavy rains would start—and now this accident had happened to knock me out.

After a very painful two hours' ride I was delivered into the hands of an old, dark-skinned woman. She went to work on the leg with a little pot of grease—probably monkey fat—which she proceeded to knead and massage into my leg with the palms of her hands. Her reputation was justified. After half an hour I felt great relief and I could bring my mind back to *Cephalopterus*. I asked her if she knew the *pavoncillo*.

Of course she did. It was very abundant around there.

"But my dear lady, are you sure we mean the same bird? You know, the black one, the size of a pigeon, with a bushy crest on its head and a little pigtail hanging from its throat?"

"Of course I know it," she insisted. "You should be here during the great storms in December. Then you would meet them on all the edges of the clearing making such a noise they almost make me crazy. There are positively so many it's hard to draw a breath in this place!"

She gasped for breath to show me how stuffy the clearing was when the Umbrella Birds came and her husband, not to be outdone, begged me when riding away to be sure to look for a depression on the left side of the trail, half an hour away.

"All the time I see them there, running around, scratching and generally misbehaving themselves on the ground," he assured me.

I thanked them profusely for this valuable information, bestowed a substantial tip for the very real relief the woman had given my leg, and left. Despite their protestations, they had been describing the Wood Partridge instead of the Umbrella Bird.

In the meantime the grapevine had travelled all over the country and some fellow well up in the mountains let it be known that he would guarantee my seeing Umbrella Birds within three days of exploring with him.

I decided to have a try and went into the mountains. The trip involved sleeping for three nights on an earth floor with a kitten and two pigs, and shifting nightly when the rain came through gaping holes in the roof. The showers were the forerunners of the heavy rains close at hand.

For the allotted three days I explored with the mountain man in the steep slopes of the continental divide and on the third day a native came running to tell us that he had seen an Umbrella Bird nearby only the day before.

That was all very well, but *I* wanted to see one. And then I came across a farmer, busily planting corn. After the usual exchange of greetings and an inquiry about my business in the neighborhood, he pointed to a tree far across the clearing.

"Last May," he said, "in that fruit tree I saw seven Crows." (In this part of the country, *pavoncillo* had become Crow, *cuervo*, and in still another part it was called the Tapir Bird, *pajaro danta.*) "I shot four of them," he went on, "and good eating they are, too. But it is no use fooling around here now. Come back in May when the rain has well set in. Then you will hear them booming all over the place. All you have to do is follow the sound and you will find them."

This really sounded like a good lead. The farmer thought a little longer.

"But I will be blasted," he said, "if I don't remember that five hours from here, going up the trail and coming to a few dead orange trees, I see or hear the crows almost every time I go by. Why don't you go and see?"

For the first time my enthusiasm mounted. I could feel in my bones that the farmer was right.

Twenty-four hours later, after I had found a horse and made enquiries about a base, I started for the dead orange trees, and found them. As for a base, there was a lone farmhouse set in the midst of rounded hills planted to grass for the cattle. On one side was a deep canyon and on the other steep slopes and heavily timbered ridges.

I was greeted by the man in charge and his numerous and curious family. Did they know the Crow?

"Why, man, you have come to just the right place," the cattleman told me. "When this farm was started I practically raised my family on the flesh of this bird. Nowadays they are much scarcer, but even so you come across one on the trail when you least expect it. At certain times you meet them in droves, seven or eight, even more, and at other times a pair only. They mostly feed in wild fruit trees, but you can also see them—especially when in pairs—catching grasshoppers and such insects and banging them against a branch to kill them."

After much bargaining I hired one of the man's sons as a guide and at 11 o'clock the next morning the boy pointed to a black bird in a medium-sized tree. The bird's back was turned to us but we worked nearer until it spotted us and flew off parallel to the trail. I just managed to see its crest. It was *Cephalopterus,* all right. There really was such a bird! For twenty-one days I had been on its trail relentlessly, and this was it.

The bird had alighted further down the trail and I worked near enough to make out that there were two of them, but they soon spotted me and made silently and swiftly off. They were genuine Umbrella Birds, but something about my calculations was wrong. They were not stupid; they were very much on the alert, and perched much too high to fit in with my plans.

The following day one of the boys took me across the canyon to the dead orange trees, the only signs left of a ranch gone back to the bush. There we heard two short, booming sounds, the second closely following the first.

The best way I know of reproducing these sounds is by blowing into the neck of a quart bottle.

A moment later two Umbrella Bird cocks came into view. One had three or four thin sticks five or six inches long, in its beak, and was being pursued by the other. They crossed the trail about ten feet above ground. By this time I was really excited and felt a stronge hope of success. That bird was certainly nesting; it would be easy to capture it, I thought. Then a doubt came. What if the bird was only displaying? Later I found it was just that.

Nothing more could be seen that day, and for a week I made regular vists to the grove of dead orange trees, staying there all day. The trail back to the base camp was so bad that I had a shed of palm leaves put up under the oranges and I camped out there day and night. After a week of observation I discovered that four Umbrella Bird cocks had selected a heavily wooded ridge as their permanent abode. Each bird had from one to three branches where he could always be found except when feeding. The distance from the ground varied from 15 to about 30 feet at first, but the birds soon sensed my designs on them and kept to the higher branches.

It was well nigh impossible to surprise them. They would always discover me first. Studying this bird, sneaking up to it and remaining motionless for hours under the punishment of a cloud of mosquitoes and horseflies took all the endurance and patience I could muster. Later the rains came and then for weeks I was wet and chilled, besides.

Here is an outline of the day's doings of our feathered curiosity:

Half an hour before it is completely daylight the bird greets the new day by his resounding boomings, first in the highest branches of the tallest trees. I think from this we can assume that he also passes the night as far away as possible from ground night-prowlers—cats, skunks and such, which must be his chief enemies.

After this early calling he makes a dive and alights on the lowest branch where he is accustomed to passing most of the daylight hours—figuratively speaking, his armchair. There he lets forth a further series of his calls and then in the twinkling of an eye he is again a hundred feet above ground, feeding on the fruit of the sloth tree which grows very tall in this area.

Having fortified himself, he notices his rivals, who are making a similar din. Wrathfully he alights on his rivals' trees, fifty to a hundred yards distant, and tries to chase them off, all the while giving out his calls. A third and a fourth bird or maybe more—to this day, I do not know how many—are attracted by the commotion, and join the chase. Black shapes flit back and forth, up and down, in the dim light. The noise is terrific. Twenty to thirty minutes later it is suddenly quiet. The birds have disappeared to feed on something more fanciful than the seeds of the sloth tree.

It is now around 6 o'clock. By 7 o'clock, the bird is back, very quiet, chockful of fruit, and he remains absolutely motionless for 40 minutes to an hour. From time to time he expels the pits of the fruit he is digesting. He feels contented, blows out the airsack on his throat and gives forth a long-drawn, low mooooh. Occasionally he notices a leaf, breaks it off, and after a time lets it fall. He goes off again to feed, this time darting through the tree top and vanishing in a straight, rapid flight above the highest trees. Usually, however, he flies between the tree tops with consummate skill and great speed, making sudden turns, never touching an obstacle.

Between 9 and 10 o'clock, *Cephalopterus* is back again. He decides to visit his rivals once more, but this time the fieryness of his temper is gone. Three, four birds are in a single tree, chasing each other mildly. A few carry small dead sticks in their beaks and from time to time utter low chuckling sounds. Sometimes they quarrel and voice their protests with a throaty oooaaahh, repeated over and over.

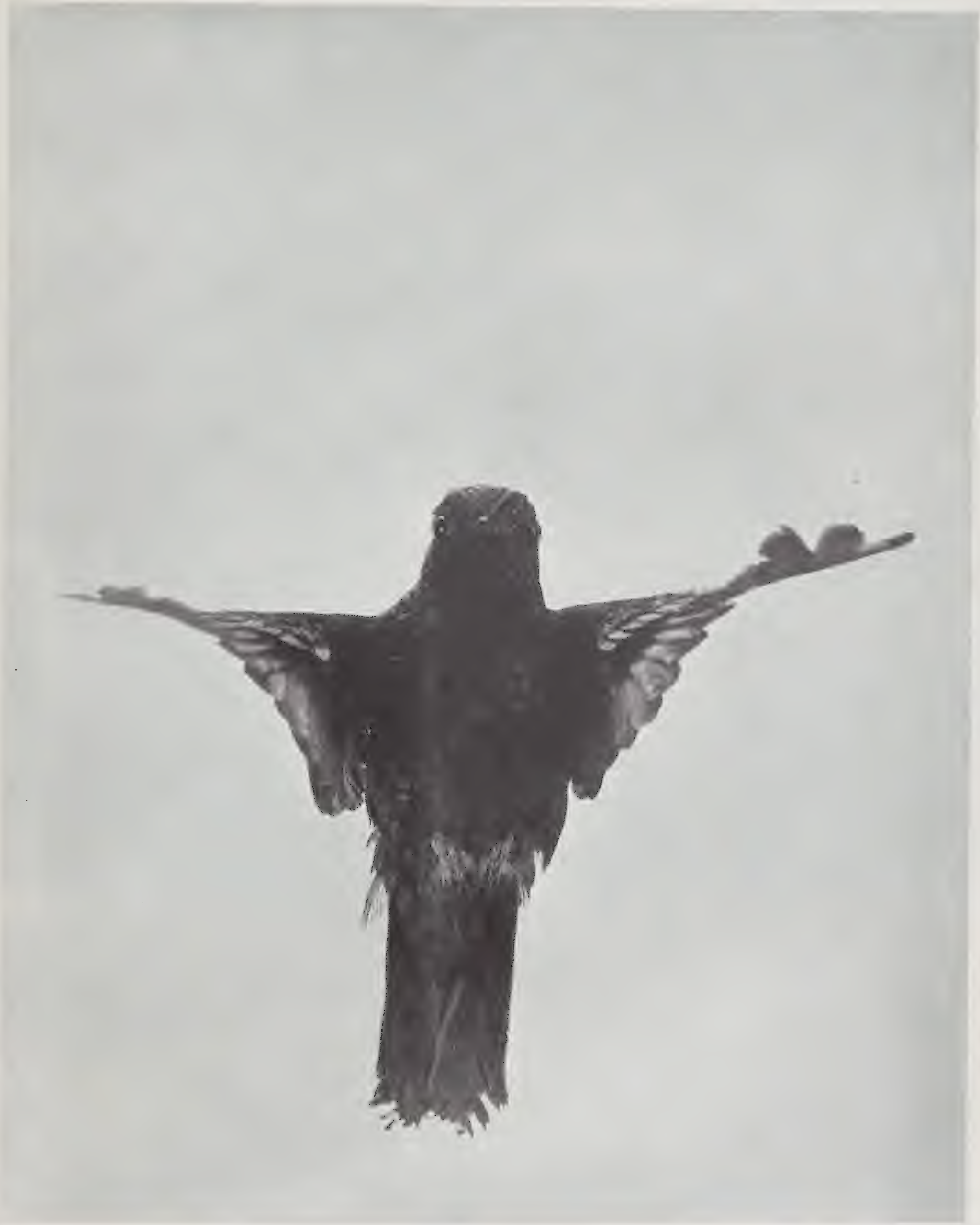
Feeding and digesting take up the rest of the day. Sometimes late in the afternoon the bird will give another booming session. He has his days of activity and his days of comparative quiet—influenced by the weather, perhaps. I noticed that all of the Umbrella Birds behaved more or less the same way at the same time.

In order to produce his resounding call the bird fills out his airsack, which is bright scarlet, to the size of a big tomato, the feather-tipped, fleshy wattle attached to the airsack becoming greatly extended and hanging down 3 or 4 inches. When the airsack is distended the boom is produced. Then he suddenly throws his head violently back, far back, and quickly forward again, expelling the air with a swishing sound closely resembling the spitting of a big cat. He immediately fills his airsack again and lets forth another boom, but now he expels the air without going through any contortion or sound. At a certain distance only the two resounding boom notes can be heard. But close at hand the spitting or swishing sound can easily bring panic to the ignorant traveller, who may flee from the "tiger" in fear of his life. No wonder this particular spot was reputed to harbor many jaguars.

There can be no doubt that the spot I had selected was a mating ground. Although I could never see a female together with the males, one specimen got caught in a pocket net I put up and is now here in the Zoological Park. A few weeks later another female almost hit my head while dashing through the undergrowth, almost in the same place. I have seen no nest with eggs or young, but had three nests pointed out to me as having been built by the Umbrella Bird. The native who pointed them out claimed to have found an almost fully-grown nestling in just such a nest once. These nests resembled oversize thrush nests. All were placed 4 to 6 feet from the ground between the trunk of a medium-sized tree and a branch.

The male calls from the beginning of April until the end of May. In July I met a party of five male *Cephalopterus* occasionally feeding and moving off in loose formation. The bird is mostly a fruit-eater, but once I saw a male make a shallow dive, alight on a branch with an enormous green caterpillar, and swallow it.

After having studied our bird for several days I had to attend to its capture. Full of confidence, I hung up pocket nets in strategic spots and soon had the thrill of seeing two males fall into them—and then the dispair of seeing them promptly back out again. Slowly the realization came to me that the Umbrella Bird was much too big for my nets. I placed practically invisible slings on his beloved branches—but they only made him shun the branches. Then I hit upon the idea of hanging, from a hook of thin wire, a few strings smeared with bird lime so that on alighting on his favorite perch the bird had to touch them. In the course of three weeks two specimens were caught that way, although one later escaped. Another flung himself into a pocket net where he did not expect to find it.



This is one of the most remarkable still photographs of a Hummingbird we have ever seen. Made by David B. Eisendrath, Jr., formerly on the staff of The Newspaper *PM* and now with the Office of War Information, with a "speed-ray" camera shooting at 1/30,000th of a second, it shows a little Costa Rican Firethroat (*Panterpe insignis*) hovering in full wing-beat, *with the back of its wings turned forward*. This peculiarity of a Hummingbird's wing movements was first discovered some years ago when high-speed motion pictures were made. They showed that the wings beat at the rate of 60 strokes a second, and that they actually turn over on each back stroke.

Nets could only be used for an hour after dawn and the strings with bird lime had the drawback that insects immediately started getting caught in them, their buzzing making the trap too conspicuous. Furthermore, the strings had to be put up with exact timing, immediately after the bird had left for a long feed. Everything had to be in place and quiet before his return.

I had one week of dry weather and then the rains set in. Life under the thatched roof got to be a nightmare. Everything was damp. I had trouble making my helpers stay more than a day or two, it was almost impossible to light a fire to prepare food, and the trail to the farmhouse an hour and a half away was often impassable. The problem of supplies became acute. Some days there would be no bananas for the birds, then no food would come through for myself.

By this time the rain was falling almost continuously and the moss-covered tree trunks never dried enough between showers to make it possible for my men to climb them with nets and strings. I had to give up. I figured it was around the twentieth of May, and it was no use staying. I ordered two pack animals to come early the next morning to help carry out the loads.

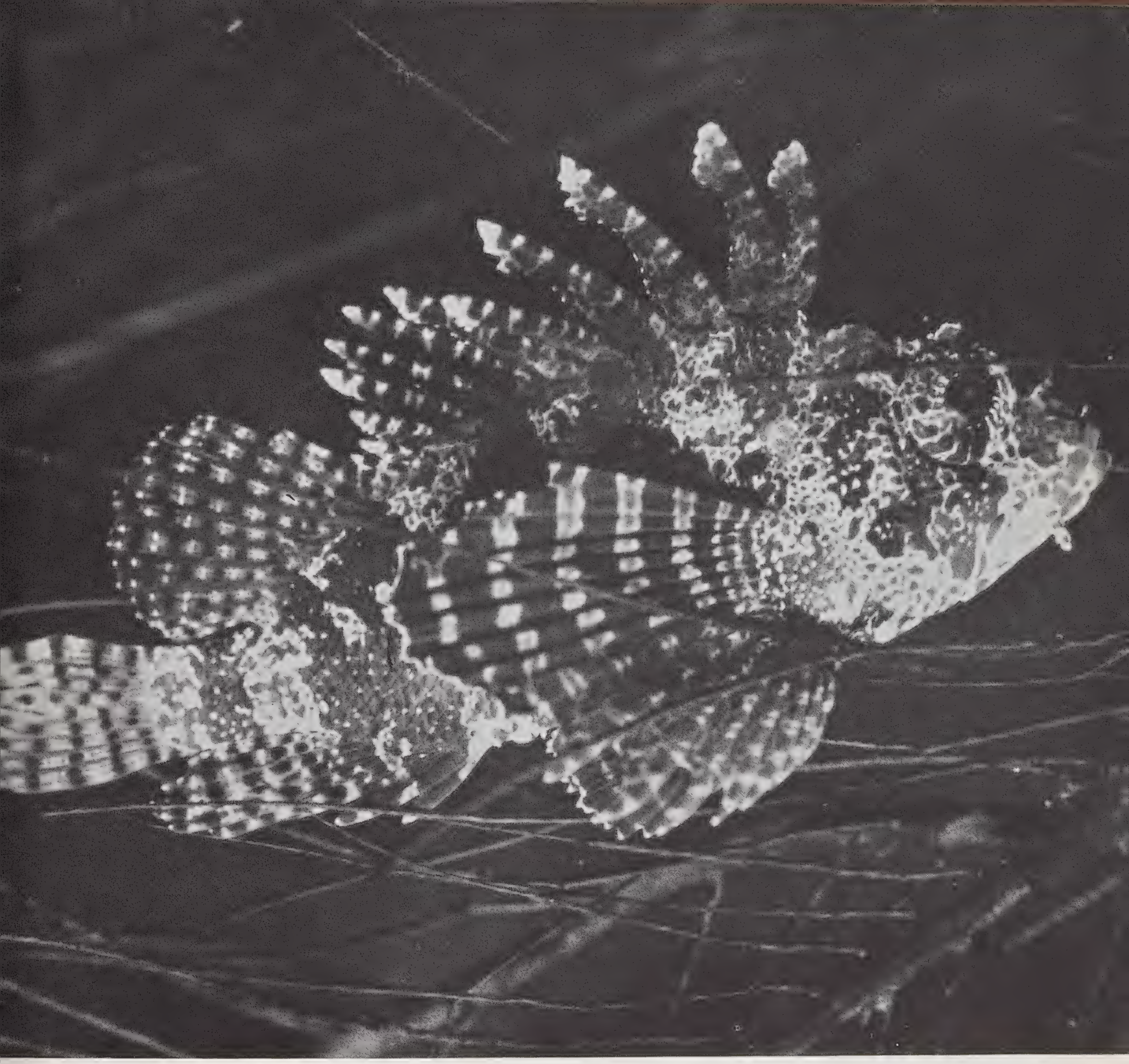
Late in the afternoon when dusk was coming on I was holding a male *Cephalopterus* on my arm with its wings tied with strips of adhesive tape when I noticed, high above, a black shape flitting from one tree to another. I kept motionless, disregarding the torturing mosquitoes and flies, and the black shape came nearer, then quite low, flitting about endlessly. It was another male Umbrella Bird. Darkness stopped his antics, but at daybreak he repeated his performance for a while.

To prospective collectors of *Cephalopterus* I would give this advice: Catch the first one and then use him as a decoy to catch the rest!

My precious load of two male and one female Umbrella Birds I carried out myself. A stiff climb brought me to a new base camp, five hours away, smack on the continental divide. Only a fraction of what I had set out to do had been accomplished. I had not managed to get a *canastada* of Umbrella Birds—a basketful—as some enthusiastic natives had promised me. Hardly did I see or hear that many, even; only eleven in all, I think. All were at an altitude of 2,600 to 3,000 feet.

But with three specimens of the Umbrella Bird in hand, I had some really tangible results for the first part of my work, and then I was ready to go after the Three-pronged Bellbird, Quetzals and Hummingbirds. I got a *canastada* of the latter two, and heard and saw dozens of Bellbirds, some at close range. But they were too smart for me.

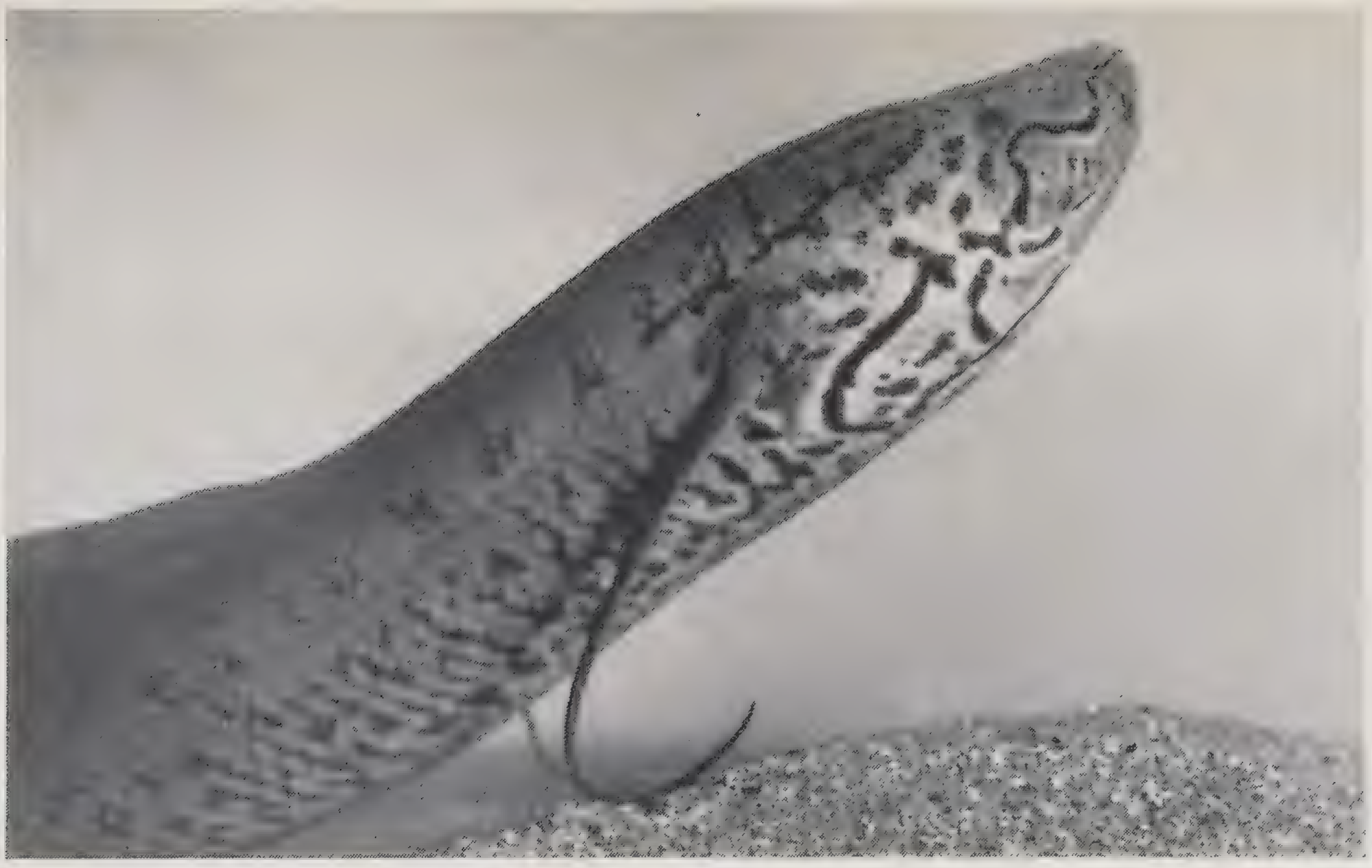
Nevertheless, I feel it in my bones that some day I shall experience the thrill of holding a live one in my hand. Maybe more than one.



FINS

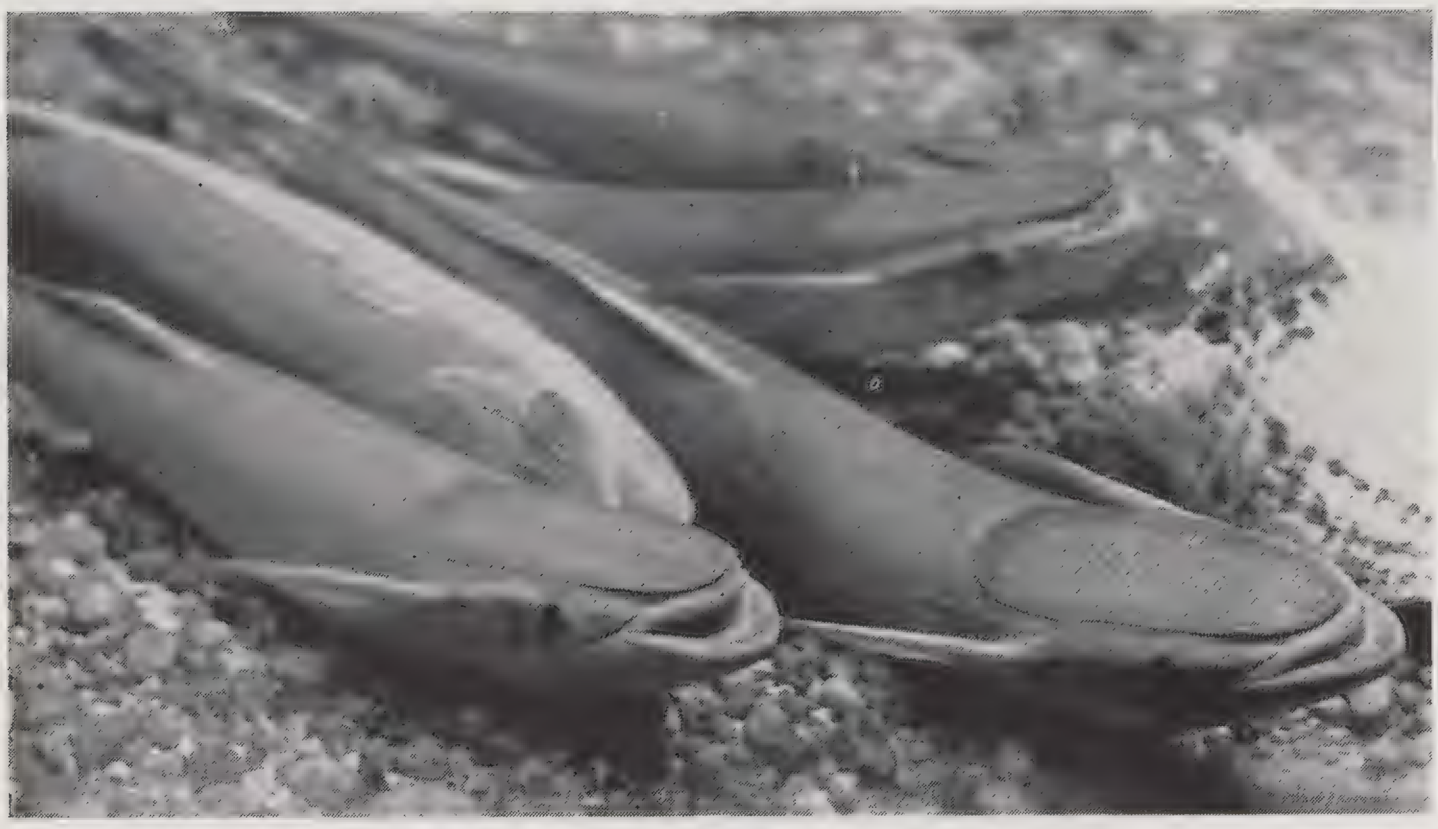
The fins of fishes are infinite in their variety and their function—although, strangely enough, comparatively few fishes depend upon their fins primarily for locomotion. Indeed, the fins can be removed from some fishes and they are able to swim and function perfectly well.

Ideally, a fish has five kinds of fins—Dorsal, Pectoral, Ventral, Anal and Caudal. Actually a very large proportion of fishes do not have all five kinds. Some—like the Scorpionfish, above—give the impression of having far more than five kinds. All flounces and furbelows, the Scorpionfish simply has a greatly exaggerated complement of fins—its Dorsal, for instance, has been broken up into multiple rays. But they all constitute one fin. Similarly, the Zebra Fish (on the cover of ANIMAL KINGDOM) has only the regular five kinds of fins—but all of them are broken up into rays.

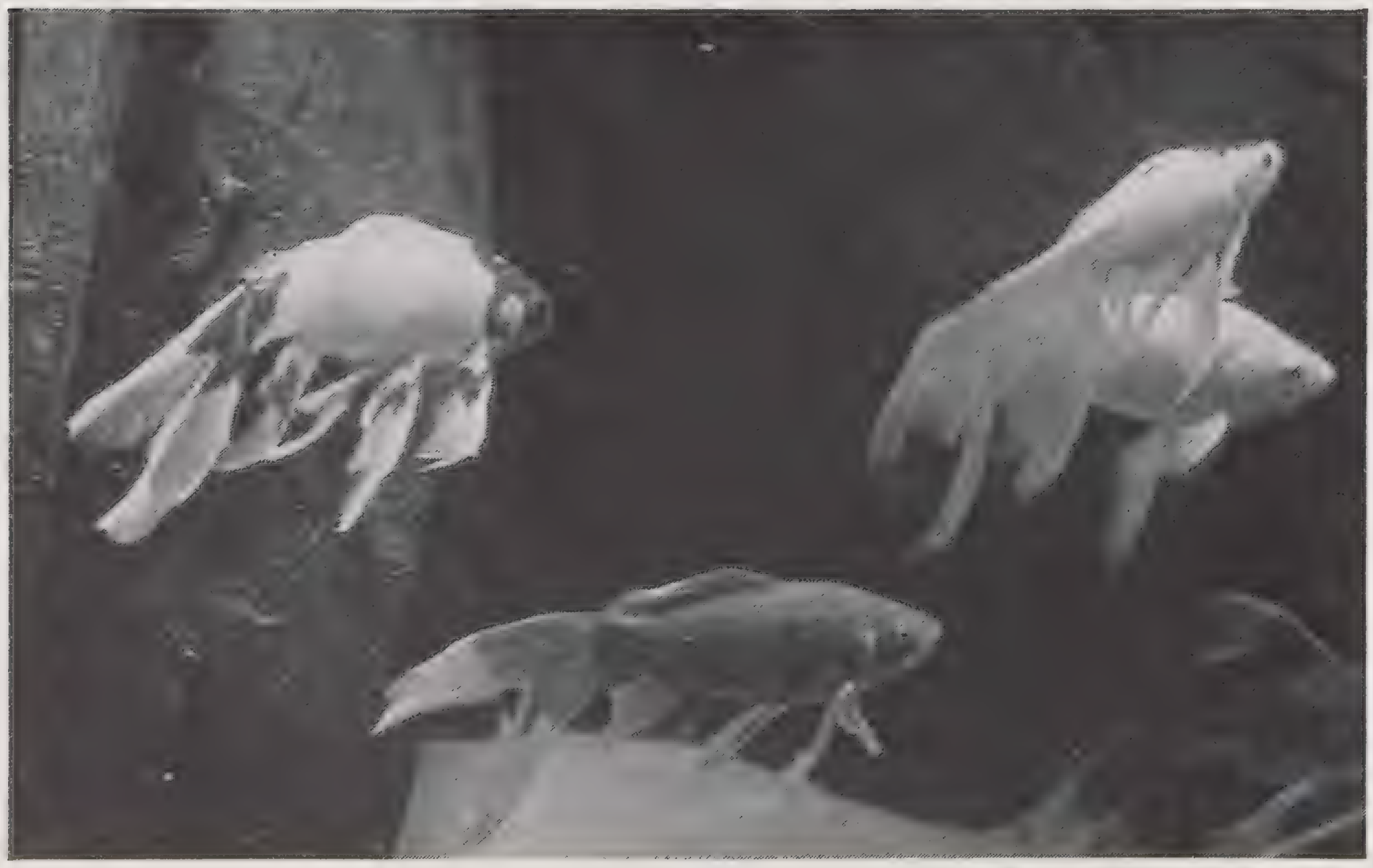


AFRICAN LUNGFISH – Flabby
ments with no underlying bony s
ture are all that remain of the Pec
fins. They are useless for swimmin

ELECTRIC EEL–Here, too, not
remains but the tiny Pectoral fins
an enormously developed Anal
which runs five-sixths of the lengt
the fish.

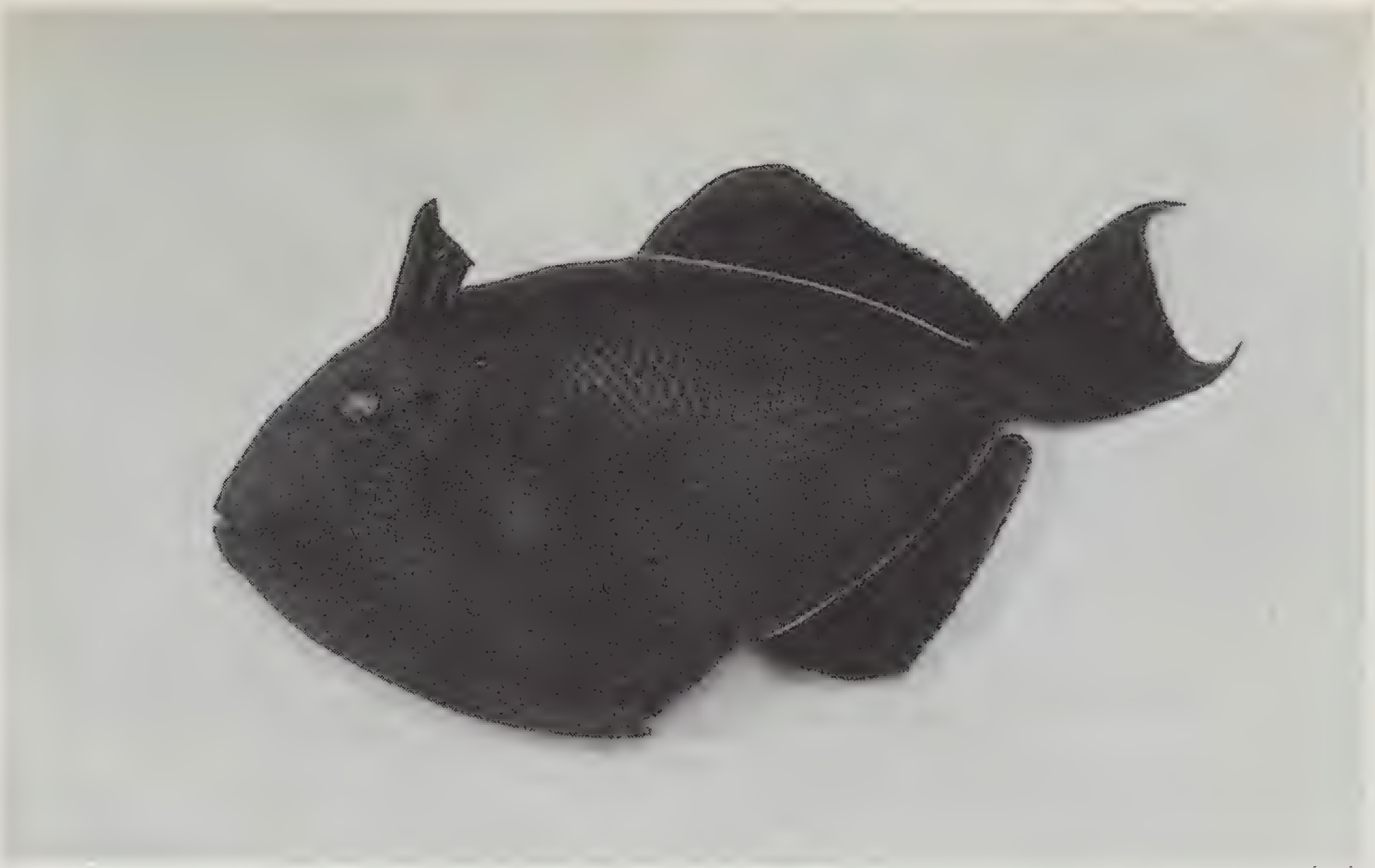


SHARK SUCKERS – One of the
curious developments among fish
exhibited here, where the first D
fin has moved forward and has bec
modified as a suction disk.

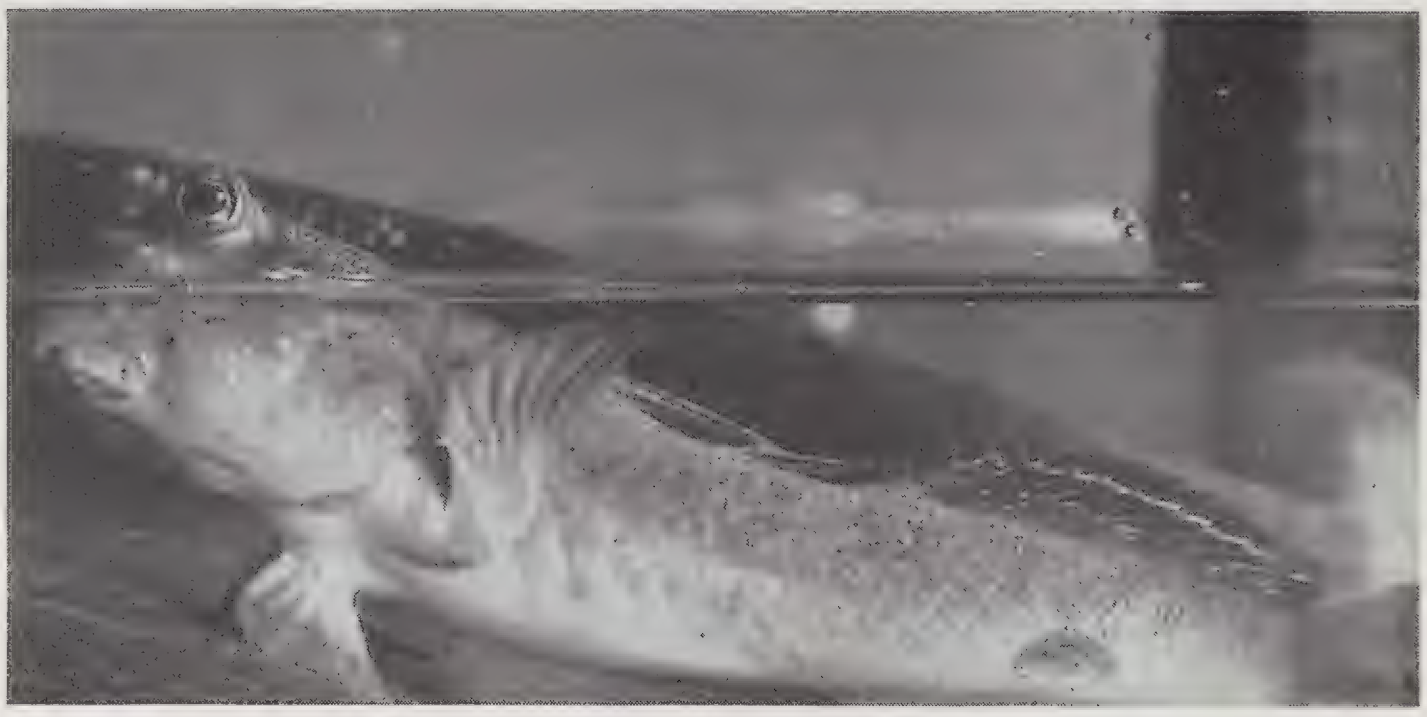


AQUARIUM-DERIVATIVE GO
FISH – These "overdressed" fish
been specially bred for extreme
velopment of fins, resulting in do
Caudal fins and greatly enlarged
tral and Anal fins.

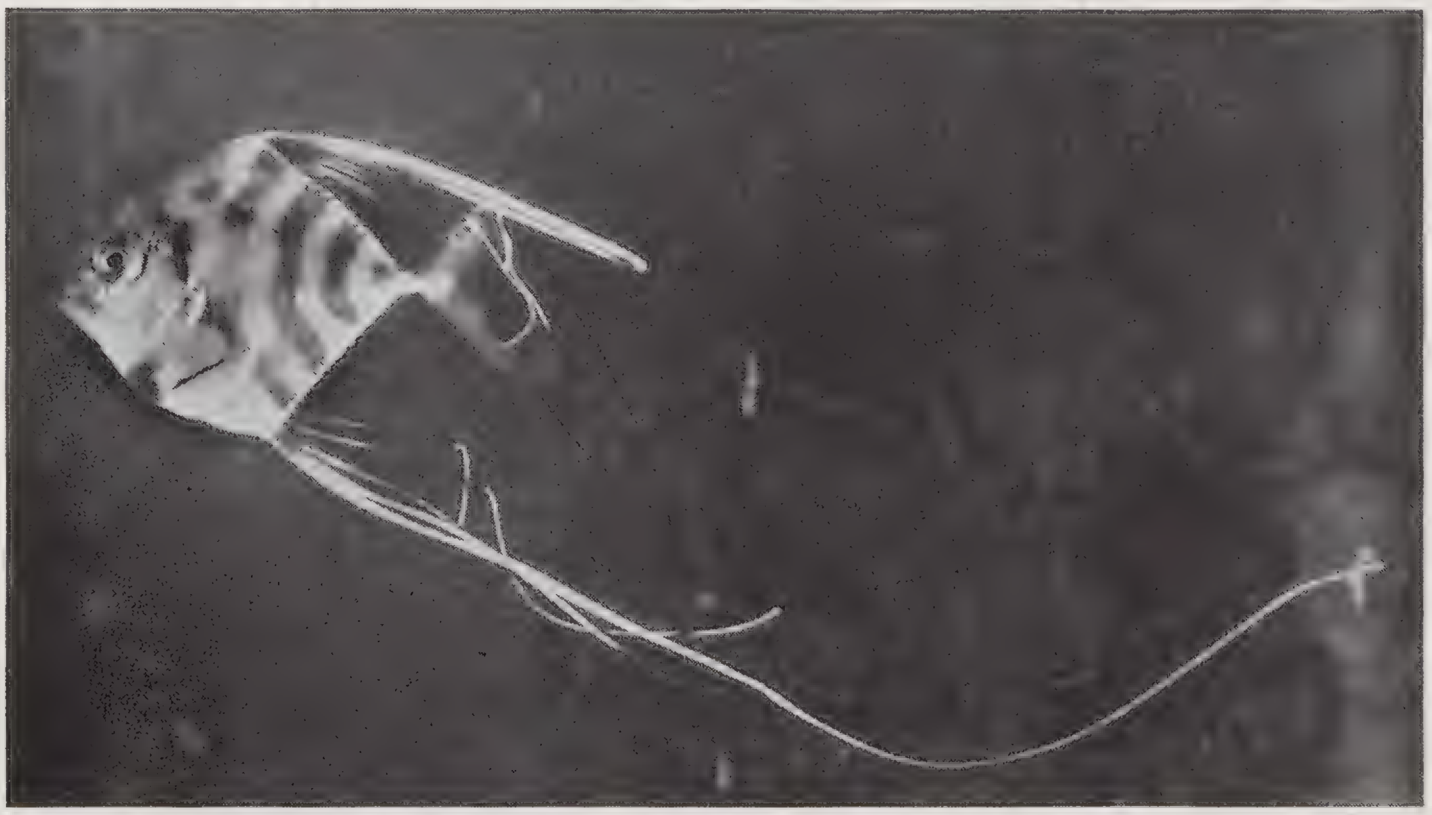
GGERFISH — The small first Dor-
n has developed a strong spine and
gger mechanism by which the fin
be erected and literally locked into
— a useful device when the fish
es itself into a rocky crevice and
s dislodgement.



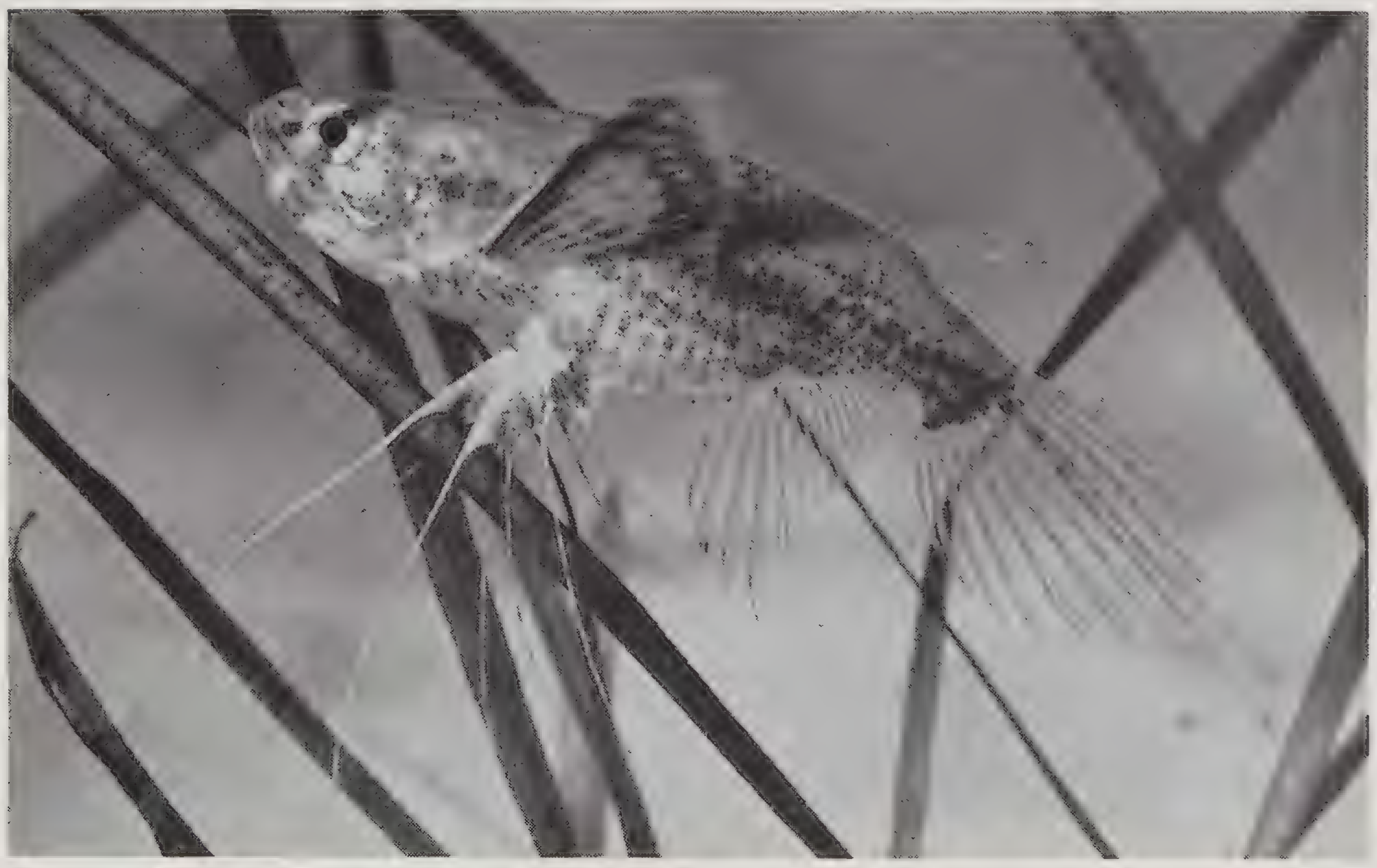
DSKIPPER — Spending much of
fe out of water, chasing mosquitoes
s a mudflat or up a mangrove root,
fish has a specialized development
Pectoral fins — they are "jointed,"
can be used very much like arms.

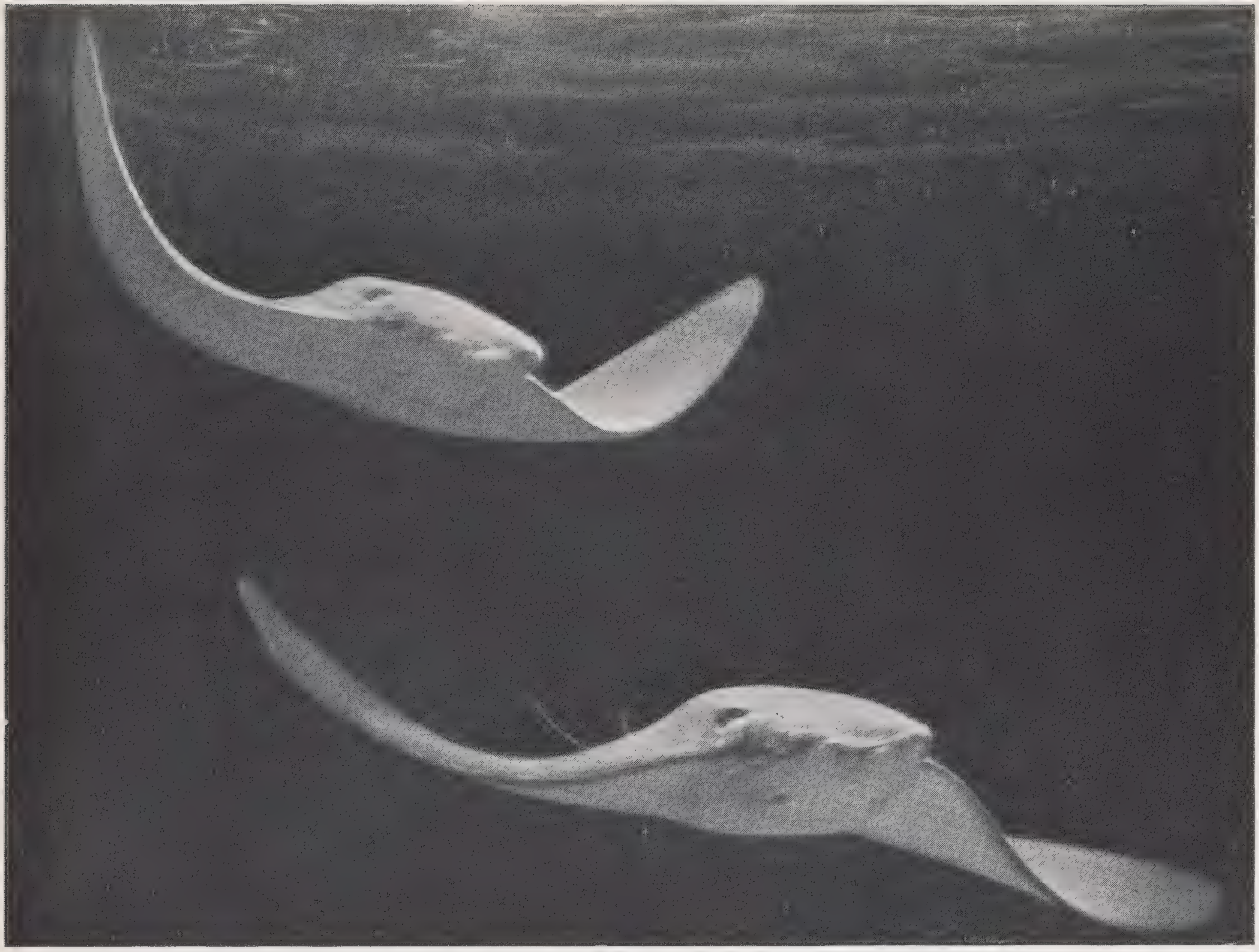


EADFISH — The streamers would
markable fins indeed if they were
but actually they are merely elon-
ns of the first rays of the Dorsal
Anal fins.

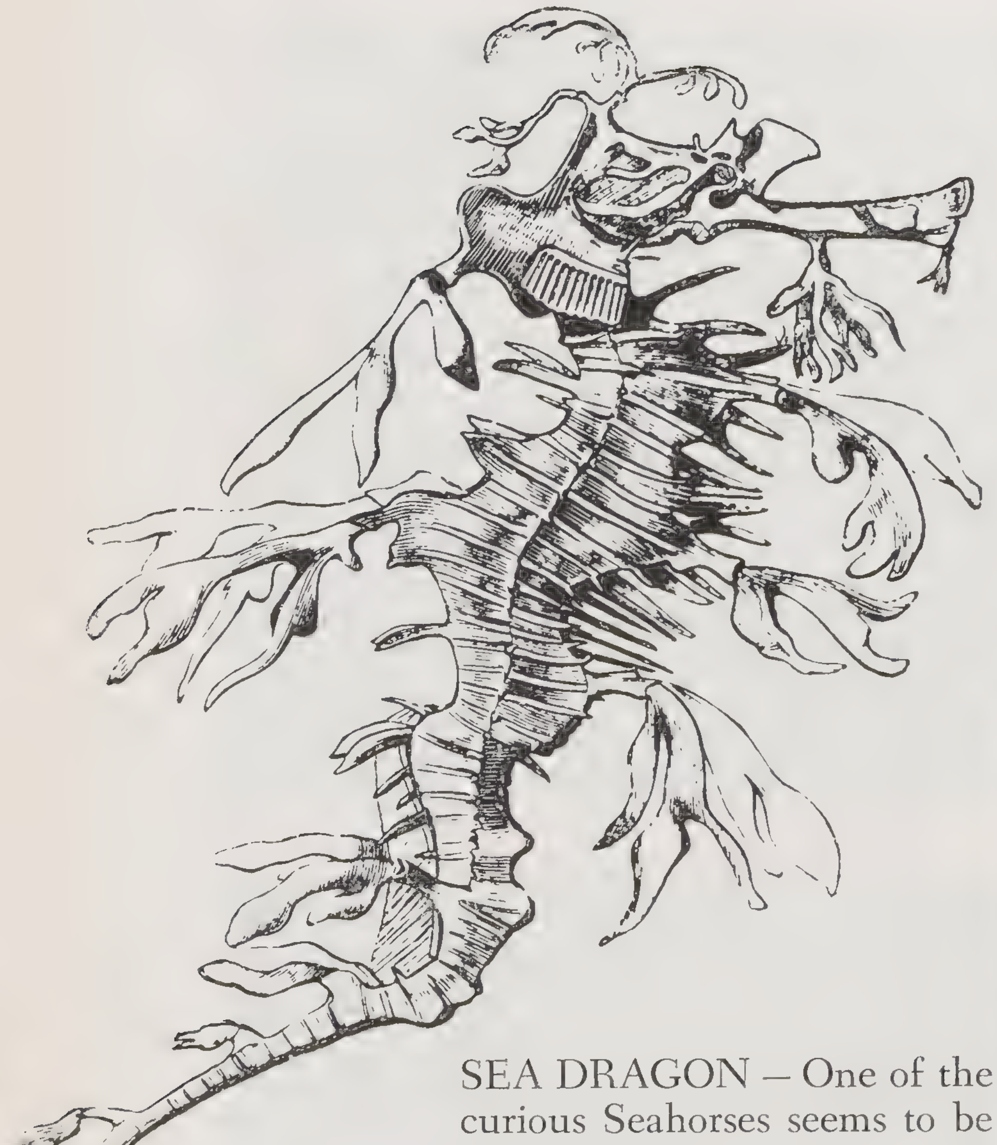


TERFLYFISH — Here the rays
e Ventral fins are enormously
ated, but the fish takes its common
from the beautifully colored, but-
like Pectoral fins.



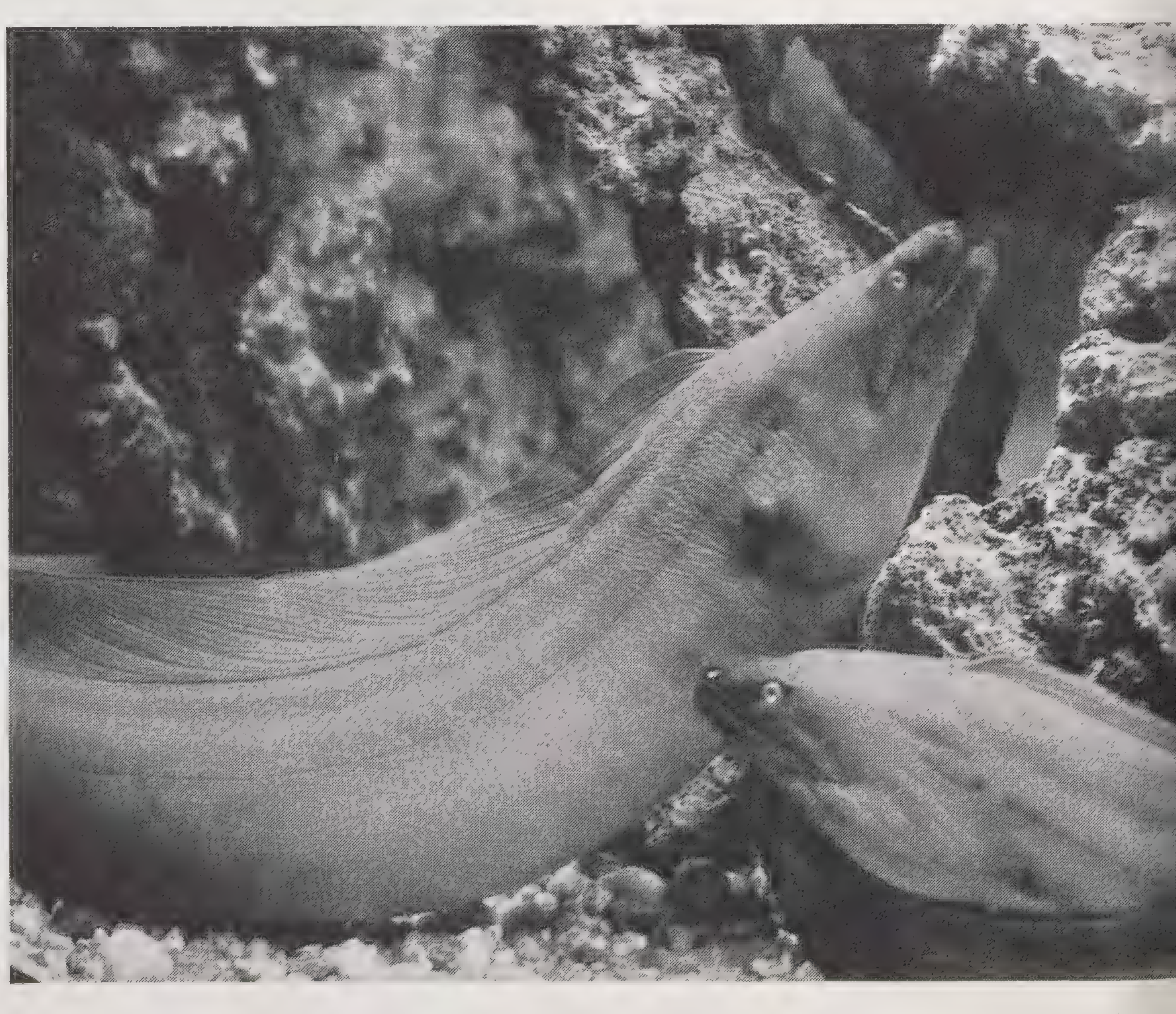


COW-NOSED RAYS – Deceptive is the word for the Cow-nosed Ray, for what might be taken for very superior fins are nothing but flattened extensions of the fish's body. The true fins have very little to do with the movements of the fish.



SEA DRAGON – One of the curious Seahorses seems to be liberally be-finned, but actually the appendages are only appendages, and the fins are the tiny "epaulette" near the head (Pectoral fin) and a small Dorsal fin at the beginning of the tail.

MORAYS – Just the reverse of the Electric Eel, the Moray has an extremely long Dorsal fin that runs the full length of the body. The other fins are small and non-functional.



Pride of the Antelope House

"Congo," the Okapi, and "Doreen," the Bongo, Are Still Great Rarities But They Lead Uneventful Lives

CLAUDE W. LEISTER

A LITTLE MORE than seven years ago a young Okapi was born in the humid silence of the Belgian Congo. This little chap was destined to come to the Bronx Zoo, where he arrived on August 2, 1937, the first of his species to be exhibited in an American zoological garden. An account describing some of the happenings incidental to this trip and the reasons why the Okapi is such an interesting animal zoologically, appeared in the September-October BULLETIN for that year.

Five years with an Okapi! What have we learned about this little-known animal in that time? The answer is surprisingly little. But we have made a number of interesting observations, nevertheless.

"Congo" was born in October, 1935. He is, therefore, seven years old and apparently fully adult. For the first three years after his arrival in New York he grew rapidly but slowed down to an almost imperceptible rate during the past year and a half. His height at the shoulder is now fifty-seven inches. We had expected him to become somewhat taller than this, since carefully measured specimens have exceeded six feet in height. It is possible, however, that growth will continue for some time to come and he may yet reach the known maximum height.

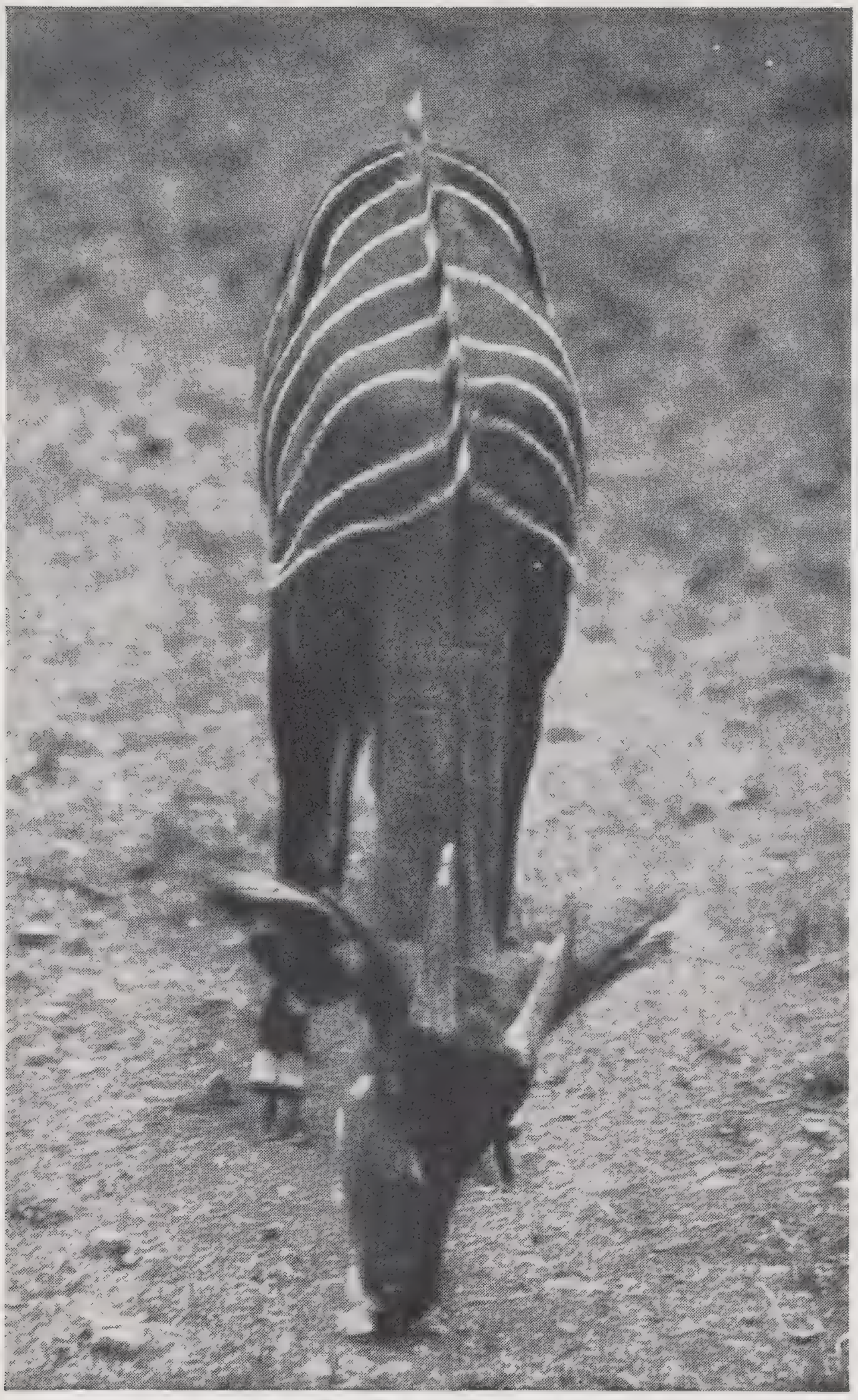
The horns, knobby little bumps on the forehead when he arrived, are now about as thick as one's finger and two and one-half inches long. They are covered with a coarse-haired "velvet," except where the tips have been worn smooth and to the bone.

In captivity, it is of course impossible to furnish an Okapi with the same food that he gets in the wild. Suitable substitutes must be found. To a certain extent, Congo had already been conditioned to "civilized" foods by the time he arrived in New York. Our own experimental work on his diet consisted of trying out new items from time to time and continuing or discarding those found acceptable or undesirable. Thus, at the present time, Congo receives a diet high in vitamin content and varied in its minerals, salts and vegetable materials. This is given in two feedings. He drinks about two quarts of water a day.

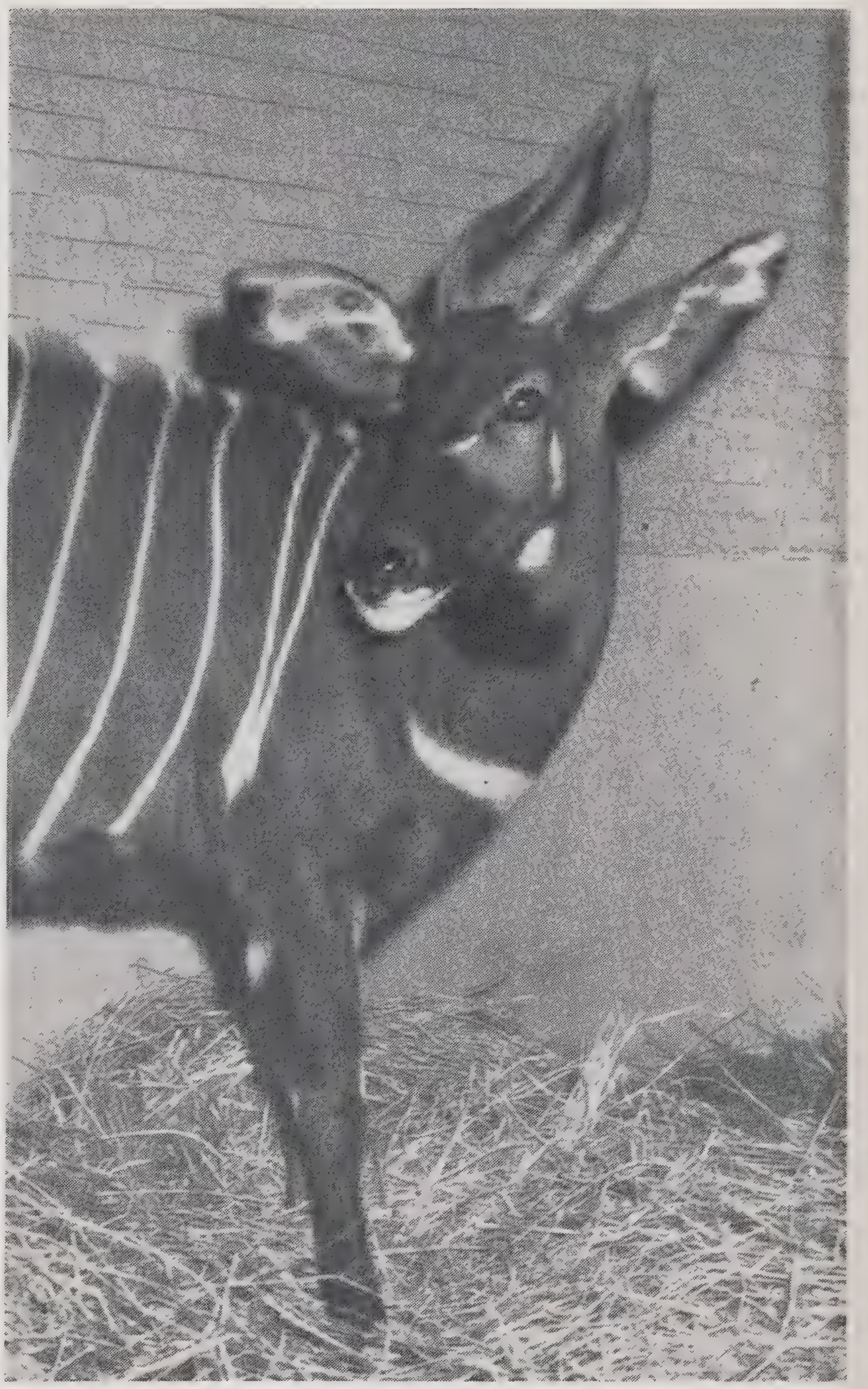
We are frequently asked if the Okapi is a "silent" animal like its relative, the Giraffe. Herbert Lang reported that one young Okapi calf, then held in the Belgian Congo, bleated like a sheep. Apparently, no one has ever heard an adult make any kind of a sound that could be regarded as vocal. We have paid close attention to Congo in this respect and we cannot say that he possesses a voice. However, he produces at least two characteristic sounds. One of these is a clucking noise, probably produced as we would make a similar sound with our tongue. He also grates his teeth with a loud, unpleasant crunching that can be heard all over the Antelope House. This seems to be a sign that he is hungry.

Congo's temperature requirements are not particularly critical. We had thought at first that our winter temperatures in the Antelope House would have to be revised upward in order to keep him warm enough. This has not been the case and he is apparently comfortable at our thermostat setting of 60°.

He shows a definite preference for the dark, humid days of summer over the bright sunshiny



"Doreen," the Bongo, was about 6 years old when this picture was taken and her horns were mere spikes, giving little promise of the ultimate form they would attain.



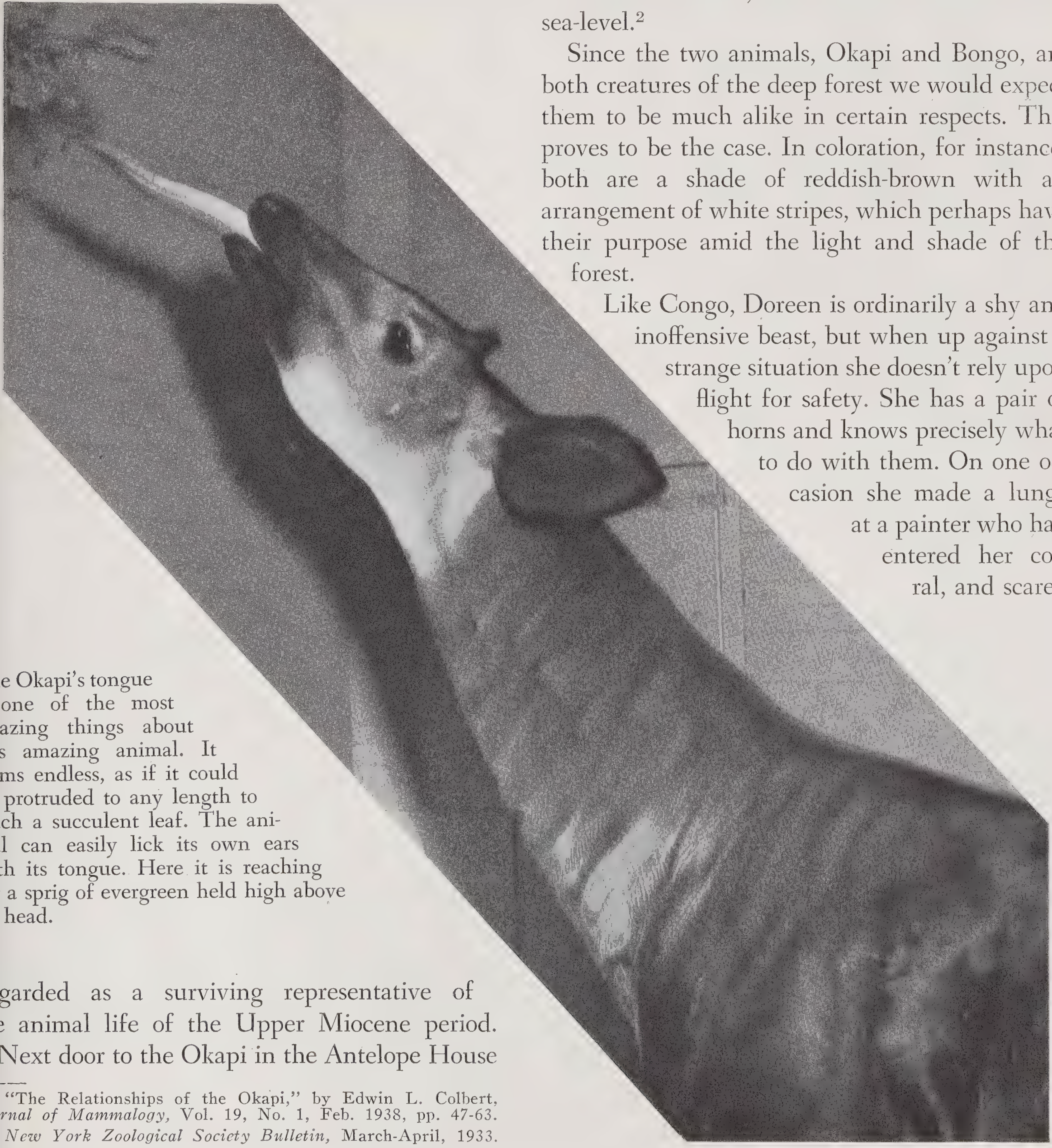
Now that she has reached full adulthood, "Doreen" has acquired the probable maximum of her horns—still comparatively short, but twisted and sharply pointed.

ones. This seems to be logical, since the Okapi's native habitat is the shady depths of the tropical rain forest. Thus, on glaring summer days he shows a reluctance to go out of doors and prefers the dark interior of the Antelope House. At other times his favorite spot is a damp and shaded corner of the outside corral.

Congo appears to be one of the most defenseless animals we have ever had and, in fact, seems to be entirely lacking in offensive spirit. He is timid, apprehensive of change (the latter as might be expected of an animal that has changed so little for fifty million years), and in disposition portrays the very essence of the words meek and mild. He doesn't butt, bite or kick. When danger threatens in the wild, the Okapi's only bid for safety seems to lie in an instantaneous and apparently undirected rush for the nearest tangle of vegetation. This instinct is carried over into captivity, although he has no cause for alarms.

Time and again, Congo has been seen dozing peacefully in his corral, all quiet and serene, when suddenly there is a violent threshing of limbs in a frantic effort to get somewhere in no time at all. He is wide awake in a second or two and almost immediately subsides into his usual quiet self. Because of our hard, unyielding fences and walls, we have been afraid that Congo might injure himself in one of these nightmares. In fact, he at one time cut a gash in his shoulder upon hitting the fence and on another occasion, indoors, lost his footing completely and scrambled around on the floor to the consternation and dismay of his keeper. Fortunately, he was not injured.

In the September, 1937, Bulletin, William Bridges told about the extreme antiquity of the Okapi and of the interesting fact that this animal has changed but little from its ancestral type of fifty million years ago. There has been some question as to whether the Okapi has survived through this long period without change, as a study of the present-day animal would indicate, or, as suggested some years ago, that the Okapi was a "degenerate" Giraffe. A recent survey[1] of osteological material concerning the Giraffidae, both living and extinct, seems to establish clearly that the Okapi "is a truly primitive giraffid, in many ways more primitive than the earliest of the fossil giraffes." It can, therefore, be truly referred to as a "living fossil," since it can be regarded as a surviving representative of the animal life of the Upper Miocene period.



The Okapi's tongue is one of the most amazing things about this amazing animal. It seems endless, as if it could be protruded to any length to reach a succulent leaf. The animal can easily lick its own ears with its tongue. Here it is reaching for a sprig of evergreen held high above its head.

Next door to the Okapi in the Antelope House is another highly prized exhibit, our Bongo, "Doreen." During the four years prior to the arrival of the Okapi, Doreen was undisputed queen of the Antelope House collection, but with the advent of Congo she was obliged to withdraw her claim of being the most strikingly-colored and rarest animal in the group.

Like the Okapi, the Bongo is native to densely forested country. Thus the typical West African Bongo lives in practically the same type of forest, but Doreen, since she is a representative of the East African race, comes from a somewhat cooler region, especially since her kind is found only in mountain forests, some thousands of feet above sea-level.[2]

Since the two animals, Okapi and Bongo, are both creatures of the deep forest we would expect them to be much alike in certain respects. This proves to be the case. In coloration, for instance, both are a shade of reddish-brown with an arrangement of white stripes, which perhaps have their purpose amid the light and shade of the forest.

Like Congo, Doreen is ordinarily a shy and inoffensive beast, but when up against a strange situation she doesn't rely upon flight for safety. She has a pair of horns and knows precisely what to do with them. On one occasion she made a lunge at a painter who had entered her corral, and scared him half to death. But she has a danger signal that we now can read correctly. A distinct "flattening" of her eyes means "Do not crowd me any further." If we pay attention to this, necessary work can be done about her quarters without danger.

---

[1] "The Relationships of the Okapi," by Edwin L. Colbert, *Journal of Mammalogy,* Vol. 19, No. 1, Feb. 1938, pp. 47-63.

[2] *New York Zoological Society Bulletin,* March-April, 1933.

Doreen shares Congo's dislike for bright, sunshiny days. Fitted for the dark depths of the forest, their eyes are apparently uncomfortable under the full glare of our summer sun.

It has been suggested that some of our troops now in Africa may have the opportunity to see the Okapi and the Bongo in their native wilds. This is not likely to happen. It will be remembered that the Okapi inhabits a rather restricted strip of territory in the rain forest of the Belgian Congo and all of seven hundred miles from the coast. It is not likely that the business of our troops will take them into this isolated and unhealthy region.

The West African Bongo inhabits a large area along the coast from French Guinea to Equatorial Africa and it might be supposed that some of our boys stand a chance to see this animal. However, it is unknown outside of dense tropical forests, where only a handful of white men have been able to find it after a long and arduous search. Members of our Expeditionary Forces are not likely to see this animal alive.

Black Lace for the Gold Platyfish

The Costume of One of America's Most Popular Tropical Fish Was Created in the Laboratory of the Aquarium

MYRON GORDON

THIS STORY begins in a small stream hidden in the hot, mite-infested jungles of Mexico's southern state of Oaxaca and stops, for the present, in the tanks behind the counters of any pet shop in New York.

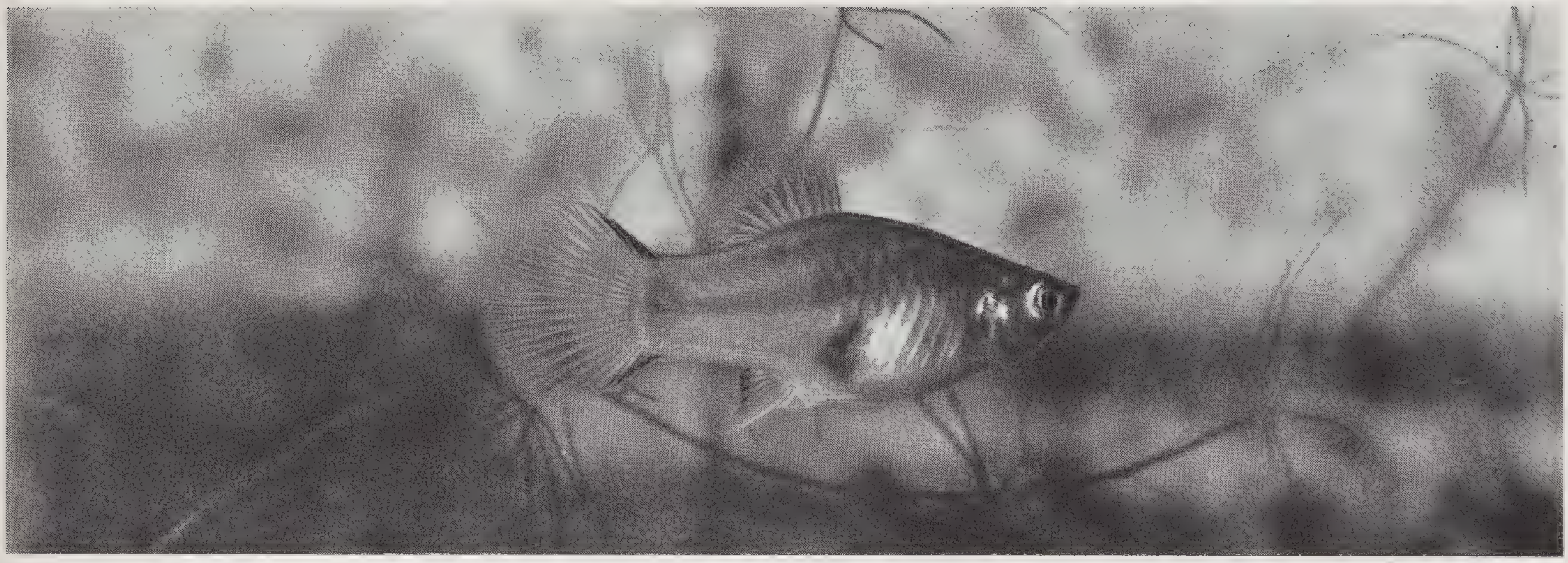
According to reports from the recent tropical fish exhibit held by the Aquarium Society of New York at the American Museum of Natural History, and from statements of sales from tropical fish dealers all over the United States and Canada, the golden wagtail platyfish, an old favorite in a dazzling new costume, has climbed close to first place in the popular demand as a toy fish for the home aquarium. Yet only three years ago, one of the grandparents of these colorful, home-bred and reared, aquarium fish was the wild, gray, undistinguished platyfish that abound by the thousands in the arroyos and lagoons of the southern states of Mexico.

Within a few fish generations, by a system of careful selection and scientific breeding, the olive drab body color of the wild platyfish has been transformed to bright gold; and each fin of the wild specimens which was colorless, has been darkened to produce the effect of an old fashioned black-ribbed, lace fan. The sharp contrast of dull black on bright gold in the new golden wagtail platyfish is particularly appealing, for rarely is this striking color scheme seen in fishes.

The new wagtail platies are fine living examples of what cordial Pan-American cooperation may produce, for they are the direct result of mating a wild Mexican platyfish with the domesticated goldplaty which was perfected in the United States.

With the consent of the Mexican Government and the generosity of the John Simon Guggenheim Memorial Foundation of New York, an expedition was organized with the cooperation of the New York Aquarium in 1939, for the purpose of studying the freshwater fishes of the Atlantic coastal rivers of Mexico. A book on this research is being prepared.

Large collections, particularly of the platyfish, were made for special studies which have been going on for many years in connection with the

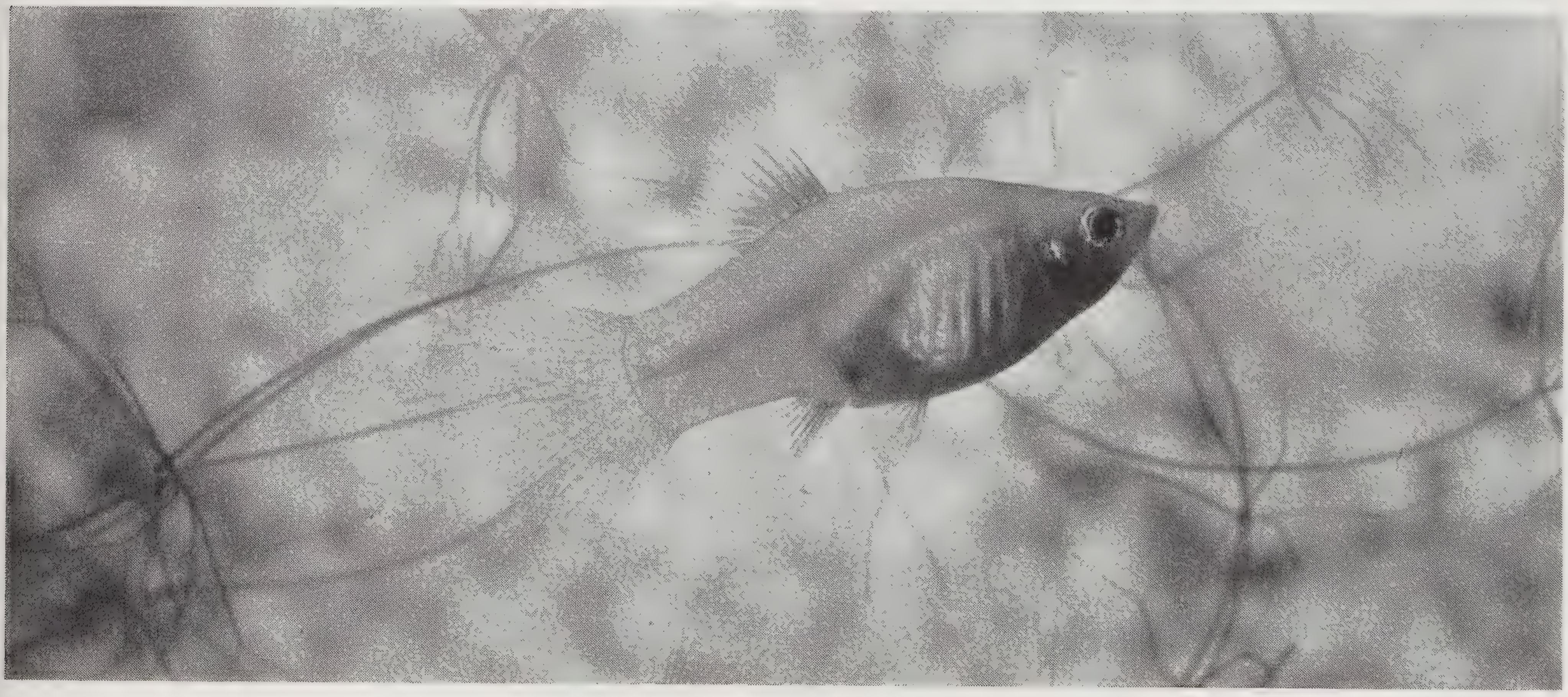


Among 8,000 specimens of the southern Platyfish collected by Dr. Gordon were 135 different color types. This one, called "The Comet," was distinguished by a black line on the upper and lower margins of the tail.

problems of species origins and cancerous growths. Altogether, we collected more than 8,000 specimens and when they were classified, we found some 135 different color types among them. This proves, we believe, that the southern platyfish, *Platypoecilus maculatus*, is North America's most variable wild vertebrate with respect to color patterns. Yet in none of these patterns was there anything that remotely resembled the wagtails of today. Among them was a variety which was distinguished from others by a black line on the upper and lower margin of the tail. The rest of the tail was transparent, as were all the other fins. We called this color type "the comet." A number of these, together with a larger assortment of other types of platyfish, were shipped 4,000 miles north to our Aquarium laboratories.

The comet platy, at the Aquarium, was subjected to a routine breeding test to see whether its pattern was inherited or whether it was just a chance variation that occasionally appears and then disappears without leaving any living representative to carry on the type. The test was simple. A wild platy with the comet markings was mated with another platy without it. We found that their offspring all had the comet pattern; and when these offspring were mated together, they produced three fish with the comet pattern to every plain type. This indicated to us, clearly, that the comet was inherited.

Then a comet platy of our original wild stock was mated to the plain goldplaty, a strain that has been domesticated for a long time, the first of which appeared twenty years ago. When their



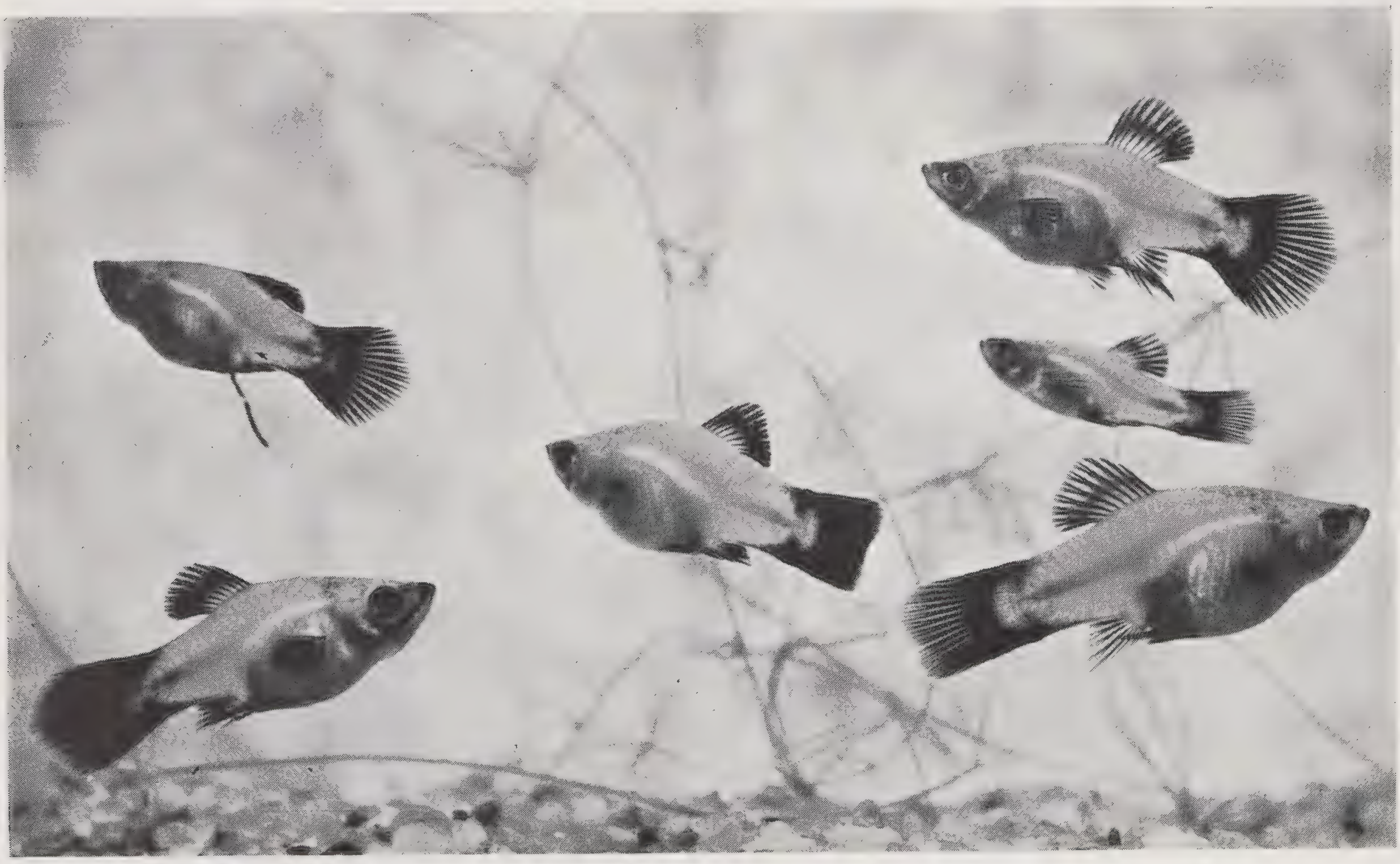
The plain Gold Platy, a strain that had been domesticated many years ago, was the second factor in the production of the dazzling creature that is a favorite in home aquaria. This fish was mated with the "Comet."

young were born, one could easily see that the gray body color of the wild platy was dominant, for all the young were gray. Later, as the gray hybrids developed, their tails became darker and darker. And when they were about half an inch long, the other fins darkened too. These were the first black wagtails, so named because of their wagging black tails.

Among our domesticated animals, the color scheme of the Siamese cat is comparable to that of the gray wagtail platyfish because its feet, tail and snout are so much darker than its body; so are, to a lesser degree, the dilute fawn breed of the Great Dane dog and the Hampshire Down sheep. But above all others, the Himalayan rabbit and the Giant Panda, with their strong contrast of jet black extremities on a snow-white body, appealed to us as being the most attractive. So we used them as models in designing a somewhat similar costume for the platyfish.

Since we already had the gray wagtails, a plan to produce a black-finned and black-snouted goldplaty was easily worked out. All we had to do was to mate the gray wagtails to each other, or mate them back to the pure goldplaty. We did both. In the first instance, we obtained the anticipated golden wagtails once in about every seven young, or to be exact, nine in every sixty-four. In the second case, we obtained the predicted and desired type once in every eight offspring. Later, when these black-finned goldplaties were isolated and mated to each other, some bred true to type. Others produced a number of comets; these were throw-backs, indicating the wagtail's ancestral origin, the wild comet-marked platy.

The golden wagtails have turned out to be so popular that fish breeders have used them to improve other varieties. Thus, now you can buy red platies with black fins; even the related swordtail has been dressed up in black tails, gloves and socks. But the golden wagtail remains the key type and the most popular. Besides its sharply contrasting color scheme there is another feature, the peculiar markings of its head, which enhances its attractiveness. The upper and lower margins of its jaws are outlined in black and the black trim runs along the lower lines of its gill covers. It looks like a golden harlequin wearing a black mask. The golden wagtail is an amusing fish to watch in the aquarium. It has the rare trick of exciting one's sense of humor. It is just the kind of fish that aquarists are looking for these days.



The result of crossing the "Comet" and the Gold Platy was the Golden Wagtail Platyfish, resplendent in golden body and fins edged in black – a striking color scheme that is but rarely seen in fishes.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

EDUCATION MOVES AHEAD

A step toward a fuller realization of the Society's educational possibilities was taken last week when Dr. Leister was named Curator of the Department of Education, with Mr. Marcy as Associate under his direction.

Active work will be undertaken in expanding popular education in several directions, including increased services to the public schools, the preparation of low-cost pamphlets on animal life, the distribution of motion picture films and the preparation of radio scripts.

While Dr. Leister will continue as Associate in the Mammal Department, he will have to give practically his entire time to the educational work.

Mr. Crandall has been named General Curator and will, in addition to his present duties in the Bird Department, handle the administration of the Mammal Department.

IT'S A DUCK WINTER

This winter, as usual, large flocks of wild ducks have visited the various lakes in the Zoological Park, their numbers guaranteeing at least enough open water to float them. About 1,000 Black Ducks, 300 Mallards, 100 Canada Geese and a scattering of rarer species were with us up to December 20. On that morning a sudden drop in temperature drove the thermometer to –3° F, congealing all nearby fresh waters as well as the margins of Long Island Sound and the East River. Many of the ducks that had been wintering there joined their compatriots in the only open water available, which happened to be ours. The most notable increase was in Black Ducks, of which we had at least 1,500. There were also a good number of Pintails and Baldpates, as well as both Greater and Lesser Scaup, a single magnificent American Golden-eye, and American and Hooded Mergansers.

For the first time since Lake Agassiz was dredged for cleaning purposes, about five years ago, the Mallards have this year reverted to a curious preference of long standing. At least 300 are segregated there, with no more than a scattering of Blacks. The latter have always preferred the Wild Fowl Pond, where there are noticeably few Mallards.—L. S. C.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since last issue of this magazine are the following:

Life

Mrs. George F. Baker
Eugene Holman
Robert Struthers

Corresponding

Dr. David Crockett Graham

Annual

Robert J. Caldwell
James McCosh Cecil
Miss Ethelwyn Doolittle
Alan Gregg
Mrs. Claira B. Havemeyer
Mrs. Mignon Lago
Roland Lindemann
Miss Elizabeth P. Martin
Roswell C. Otheman
Harry C. Perry
Mrs. Mildred Steele Woods

OLD-TIMER

In 1914, Col. Theodore Roosevelt led an expedition down the mysterious Brazilian river that for a long time went under the provocative name of the River of Doubt, and which the Brazilian Government later christened the Rio Teodoro or Rio Roosevelt in honor of the late President. Somewhere along the way a forty-pound tortoise was acquired and carried along by returning members of the expedition, eventually reaching the Zoological Park. Here it was identified as the South American tortoise, *Testudo tabulata,* a species which ranges widely through South American jungles, feeding on the fruits of jungle trees. Today, twenty-eight years later, the tortoise is still with us.

Soon after the arrival of this animal Dr. Ditmars, in a note published in the Zoological Society's BULLETIN, commented on the large size of the specimen and stated that it was evidently a very old example as the bright yellow markings normally found on the upper shell of this species were completely lacking. Mention was also made that the tortoise was contentedly browsing with

Memories of the first World War are evoked by this picture of the Zoological Park's Lion House in the spring of 1917 when the north half of the public space in the building was turned over to the Red Cross as a workshop. Sixteen sewing machines were installed and for months volunteer workers made hospital garments for soldiers.

others of its kind upon lettuce leaves and bananas.

Through the years this tortoise has placidly munched its way through a continuum of lettuce leaves and bananas, although with the coming of war and restrictions on certain kinds of food, the number of bananas consumed has dwindled steadily and at the present moment such delicacies can exist only as a memory in the mind of this slowly cerebrating animal. Surprisingly enough, while it has remained in excellent health during the twenty-eight years, the tortoise has gained only eight ounces in weight!—J. T-V.

YOUNG ANIMALS

Gray Wallaby

During Christmas week a young Gray Wallaby — probably about three months old — put his head out of the maternal pouch for the first time. The world proved a harsh place, however, for the mother died early in December of a throat infection, and at present the baby is being hand-fed in the Hospital. It gets warm milk three times a day and with luck we may be able to save it.

Klipspringer

We were glad to find a baby Klipspringer on December 11. As might be expected, they are delicate and dainty little things and on two previous occasions we have been unable to raise them to maturity. The present youngster seems to be doing as well as can be expected and nurses regularly. The ears of a young Klipspringer are relatively large, somewhat rabbit-like but more rounded. While resting in the back of his cage the baby's ears are usually cocked forward to catch the many strange sounds of the Zoo. At such times he looks so much like a rabbit that the Keepers refer to him as "Rabbit-ears."

Our pair of Klipspringers were extremely wild following their arrival two years ago. They have changed remarkably and are now one of the tamest of our animals. An elevated lookout has been provided in their outside corral. Here they pose, almost motionless, for long periods and to the delight of our visitors.—C. W. L.

MEMBER EXTRAORDINARY

Mrs. John VanderPyl joined the Zoological Society a number of years ago as an ordinary annual member, but it was soon apparent that she was in a class by herself, which we might identify as Member Extraordinary. Besides running a city apartment and a country house, and being an active officer of the Red Cross, she has found time to turn her superabundant energy and interest into scientific channels. She has twice, once in 1929 and again ten years later, joined Tropical Research Expeditions to Bermuda, doing such excellent work that Dr. Beebe made her one of the Honorary Associates. Again in 1942 she spent seven weeks with the Venezuelan Expedition in Caripito.

Her especial undertaking has been the study of the oceanic lanternfishes, and by giving generously of odd hours and days, she is well along in a paper on this group of deep-sea fish.

Realizing the vital need of the Zoological Society for an adequate membership, Mrs. VanderPyl has quietly proselyted her friends, and at last count had persuaded upwards of ten to join.

With more such Members Extraordinary the Zoological Society would feel the vitalizing effects in every department of its activity.

LETTER FROM A MEMBER

Visitors to the Zoological Park each year are numbered by millions — in itself a comment on the Society's success in attracting interest to its exhibits — but few concrete expressions of their appreciation or understanding of the Society's purposes ever reach the ears of the staff.

Recently President Osborn received from a new member of the Zoological Society, Mr. Harry Eldridge of Albany, a letter which states so well the reaction that we hope our collections will produce in visitors, that we take great pleasure in reproducing parts of the letter here.

As a young man Mr. Eldridge lived on Long Island and from his father he gained a life-long interest in animals and the out-of-doors.

"Marriage and the picking up of business again, left little opportunity of actively continuing that amateur interest," he wrote. "But as our children have grown, I must have recalled my own early introduction to nature and its wonders, for instinctively I have wanted to pass on that most valued aspect of my inheritance, even in spite of the vast changes that have come to limit its nearby enjoyment.

"In this year fraught with uncertainties and sacrifice, vacation plans were put off on the hope of a brighter horizon. That not being forthcoming and the immediate future appearing if anything more curtailed and indefinite, we decided to give the children a memorable experience even though concentrated and possibly beyond their full grasp at the moment. So, following a few days spent in the open along a nearby trout stream, we journeyed down to Bronxville and the next day visited the Zoological Park. For me it was a return after possibly twenty years' absence. For the rest of the family it was their first visit. The park was open to the public; it was a glorious end of an August sunny day; and literally, until closing time, we wandered about, lost in admiration of all the new and many wonders contained in that area and conscious of the tremendous contribution they were making to the enjoyment of the scores of other visitors. For me it was a revelation. I had no conception of the strides made in the display of animals. I was drawn back again and again to the African Plains, or the Wapiti (I shot two of these as a boy one summer in Wyoming), or the Okapi, or the Aquarium. Of course, the Children's Zoo was a delight, and again I marveled at the presentation. Even the absence of the Rocking Stone Restaurant, my only recollection from the past of a place to eat, was perfectly compensated for in the discovery of the Zoo-Bar. Coming out at last from the Heads and Horns exhibit, I had to do something to record the whole family's appreciation for the unique day they had been enjoying. Therefore, my visit to the Administration Building and the taking out of membership. We continued on to see the Monkey Island and then the Farm-in-the-Zoo, the end of an outstanding experience and the beginning of what I hope may be a long interest and affection.

"Why should I bother you with this personal recital? I only feel that I must try to indicate the effect of something very close to your interests and attention on one person fortunately coming under its influence. Today we are all confused and many refuges are being violated. But the future can be bright if it is to contain and reenforce illustrations of the agelessness of the world and the permanence of natural wonders to inspire and rekindle our innermost ideals and affections. I have enjoyed putting myself on record and have to some small measure started repaying a debt which I trust will never be completely repaid, the one I now owe the New York Zoological Society."

PUBLICATIONS OF INTEREST

THE AMATEUR SCIENTIST, by W. STEPHEN THOMAS. W. W. Norton & Co., Inc. New York, 1942, 291 pp., 16 photographs, $3.00

The amateur scientist is the possessor of a long and honorable tradition. Many of his predecessors attained high rank in their fields, equalling and sometimes surpassing contemporary professionals. Now, thanks to social changes and mechanical aids, most of us have an increasingly greater amount of spare time that can be devoted to cultural and intellectual pursuits; and those who, in this troubled world, can devote their avocations to some scientific work which brings them into intimate contact with the complexities of life on earth or of the lifeless aspects of the globe, may expect to have a better understanding of the elements necessary for living happily with their neighbors the world over.

Under any circumstance, the individual with an avocation becomes a better citizen, and if he can make his hobby, if it is a scientific one, contribute to the sum of the world's knowledge so much the better. After all, as far as science is concerned, there is no distinction between the truth as determined by a professional or by an amateur.

Mr. Thomas, who is Executive Secretary of the Committee on Education and Participation in Science of the American Philosophical Society, has made a careful and interesting study of such matters as the kinds of people who become amateur scientists, their ages and employment, their equipment and how they function in regard to their communities, and what the communities offer them, as well as many other aspects of this inquiring and interesting group of citizens. In order to obtain this data the author sent questionnaires to a large number of members of scientific clubs and institutions in the Philadelphia region. His conclusions, therefore, are based upon a broad groundwork of information, and long, careful study of other aspects of amateurs in many fields of inquiry. As a consequence we have in this book an ably correlated summary of what we know about modern day scientific avocations, and those who participate in them.

The obligation of the zoological park or museum or other institution to interest and assist the amateur in his chosen field is self-evident. The past record of help given to the non-professional is, as far as American institutions are concerned, an excellent one, and there is no reason to think that this record will not be surpassed in the future. Mr. Thomas gives us new ideas as to how our institutions may accomplish this.—J. T-V.

VOLES, MICE AND LEMMINGS. By CHARLES ELTON. Oxford University Press, 1942. 496 pp.

It has been said of Charles Elton that he is in many ways a modern counterpart of Charles Darwin, and this, his latest book, goes far to substantiate such claims. By this we do not mean that *Voles, Mice and Lemmings* will ever exert the profound influence on modes of philosophy and ethics that the *Origin of Species* did, but that in interest, scope, literary qualities, generality of propositions therein put forth and practical importance it compares most favorably with Darwin's classic.

Problems in Population Dynamics is the subtitle of the present volume, for it is this aspect of animal life which it considers. The plagues of mice, lemmings or voles, *i.e.* field-mice, have at times been veritable scourges, astronomical numbers of these pests devastating crops, vinyards and pastures, ruining orchards and forests and befouling stored produce of all sorts. Following these periods of superabundance come periods of great scarcity when hardly a creature can be found. From where do these hordes suddenly originate and to what place do they even more suddenly disappear? Some of these plagues occur irregularly, but many reappear at short, regular intervals of from three to ten years. This strange *cyclic* behavior of populations of mammals has been Elton's principal concern for a number of years; now he has taken time to summarize and coordinate his vast knowledge of this phenomenon.

He has devoted the first portion of his book to a brief review of what is known about voles, mice and lemmings and their periods of increase and decline. The history of the idea of population cycles is outlined, from the original conception that superabundance resulted from migration or other rare phenomena, through the one recognizing the enormous powers of multiplication possessed by small mammals and those factors such as predators and disease which tend to keep down their numbers, to the present idea that cyclic changes are *inherent* in any predator-prey or parasite-host relationship, the cycle itself, of course, being modified by many outside influences.

The work of the Bureau of Animal Population at Oxford is treated in two chapters. This young, but important, organization was founded by Elton in 1932. The New York Zoological Society was instrumental in bringing about its birth and in supporting some of its initial efforts. This financial aid is graciously acknowledged several places in the book.

The latter half concerns the cycle of fur production in northern Canada and Labrador. The rhythmical fluctuations in amount of furs traded at the Moravian Missions and the posts of the Hudson's Bay Company provide the basic material. A surprisingly regular four-year cycle is demonstrated. The gathering of these data entailed considerable bibliographic work, employing little known and generally unavailable references. In fact, the whole volume stands as a notable bibliographic achievement, for not only are commercial reports used, but invaluable lists of references to the French, German and particularly the Russian scientific literature are given.—JAMES W. ATZ, U. S. Army.

BOOK BARGAINS

Publications of the New York Zoological Society
Offered at Savings of 50¢ to $1.50

THE AMERICAN BISON — By Martin S. Garretson

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for the first accounts of its appearance and habits, pictures its wide range and incredible numbers. It sets forth authentically the natural history of the animal, describes the tragic course of extermination that ranged unchecked until there were only 1,091 bison left in the whole of North America, and then it tells of the rise and development of a strong national sentiment that saved the species from extinction. *254 pages, 65 illustrations.*

Was $2.50 . . . . . Now $1.50

PETS AND HOW TO CARE FOR THEM — By Lee S. Crandall

As Curator of Birds in the New York Zoological Park, Mr. Crandall has responsibility for the diet, health, cage conditions and general well-being of some 2,000 birds of many species. Out of his experience with the Zoological Park's collection and a life-long enthusiasm for pets of every kind, he has written a completely authoritative and practical book on pets and their maintenance in good health. He devotes individual chapters to Dogs, Cats, Domestic Rabbits, Small Wild Animals, the General Care of Birds; Pheasants, Peafowl and Guineafowl and Quail, Waterfowl, Parrots, Cage Birds, Canaries, Domestic Pigeons, the General Care of Fishes and Aquarium Fishes. *296 pages, 96 illustrations.*

Was $2.00 . . . . . Now $1.00

PRESENT DAY MAMMALS — By Claude W. Leister

Students in Zoology and Biology classes and the general reader who has often been puzzled by the relationship of animal groups will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. It answers such questions about mammals as: What does it look like? How big is it? To what is it related, and why? Whence does it come? Typical representatives of every Order of mammals are pictured here, accompanied by a clear text explaining the zoological status of the animals. *74 pages, 106 illustrations.*

Was $1.00 . . . . . Now 50 cents

Order from:
Department B, Zoological Park, Bronx Park, New York City
(Make checks payable to New York Zoological Society)

NEW YORK ZOOLOGICAL SOCIETY
FOUNDED 1895

XLVI • No. 2 MARCH–APRIL 1943

90.673
A59

ANIMAL KINGDOM

SMITHSONIAN INSTITUTION
APR 3 1943
NATIONAL MUSEUM

BULLETIN, PUBLISHED BY THE
NEW YORK ZOOLOGICAL SOCIETY

TERMATH OF A SCIENTIFIC EXPEDITION, *by William Beebe and Jocelyn Crane* •
BOUT HOMING PIGEONS, *by Lee S. Crandall* • NOTES FROM THE ZOOLOGICAL PARK

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field
De Forest Grant
Warren Kinney
William De Forest Manice
David H. McAlpin
Robert Moses
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Eugene Holman
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert I. Gannon
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van . . . . *Executive Secretary*
Jean Delacour . . . . *Technical Adviser*
William Bridges . . *Editor & Curator, Publications*
C. J. McGahey . . . . *Comptroller*
Claude W. Leister . . . . *Curator, Education*
Donald Marcy . . . . . *Associate, Education*
Millward W. Heath . . . *Supt., Construction & Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*
Claude W. Leister . . . . *Associate, Mammals*
John Tee-Van . . . . . . *Associate, Reptiles*
Leonard J. Goss . . . . *Veterinarian*
Harry C. Raven . . . . . *Associate, Anatomy*
Grace Davall . . . . *Assistant to General Curator*
W. Reid Blair . . . . *Director Emeritus*
William Beebe . . . . *Honorary Curator, Birds*

AQUARIUM

Charles M. Breder, Jr. . . . . *Director*
Christopher W. Coates . . . . . . *Aquarist*
Ross F. Nigrelli . . . . *Pathologist*
Myron Gordon . *Research Associate in Genetics*
George M. Smith . *Research Associate in Pathology*
Homer W. Smith . *Research Associate in Physiology*
Charles H. Townsend . . . . *Director Emeritus*

DEPARTMENT OF TROPICAL RESEARCH
William Beebe, *Director*

Jocelyn Crane . . . . . *Research Zoologist*
Henry Fleming . . . . *Entomologist*
George Swanson . . . . *Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE
NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVI APRIL 1, 1943 No. 2

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York, N. Y. Title registered with United States Patent Office.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

In the Mail

As may well be imagined, the mail brings inquiries of infinite variety regarding animals, discoveries of our research staff, or the doings of the Society in general. A doctor writes in for the latest results gained from our neuro-physiological studies on the electric eel. A youngster reports a migrant bird and, describing it not too clearly, requests identification. A Government agency asks our opinion as to whether a parasitical condition common to a certain kind of fish disqualifies it for human consumption. An eminent lawyer, burning for the knowledge that elevates, seeks data regarding the characteristics of prehistoric elephants. Mixed up with the more serious mail comes a letter from a perturbed boy who informs us that his pet alligator "does not look so well this week" and requests immediate advice as to treatment. An ardent citizen, having just read the newspaper accounts of the new Aquarium plans, encloses a dollar bill to help meet its construction costs! A recent letter urges us to continue the African Plains method of exhibition – an exhortation that is scarcely needed. This letter reads in part, ". . . such freedom for animals would be one proof that humanity is worth and will get the freedom fought for and which is being paid for so dearly. We had to start with the Society for the Prevention of *Cruelty to Animals* before it was ever thought of for *Children!*"

Yes – there is generally something interesting in the mail.

Fairfield Osborn

IN THIS ISSUE

"False-face Insect" from Venezuela . . . . COVER
Cashing Jungle Dividends
  Part 1: General . . . . *William Beebe* 27
  Part 2: Specific . . . . *Jocelyn Crane* 30
Portraits of Four Primates 35
Homing Pigeons in Peace and War . . . *Lee S. Crandall* 39
Newest Animal – the Kouprey . . . . *William Bridges* 43
Behind the Scenes: News and Notes 45

SHOP TALK

As this is being written, spring seems very far away. A wet, clinging snow is falling and a laborer with discouragement in every line of his sodden coat is trying to abolish the slush by pushing it into corners and along the margin of the pavement.

All week there has been a stream of newspaper reporters and photographers looking for "signs of spring in the Zoo." Even the reporters are disheartened today.

But the animals are sure. Spring is just around the corner. March snowstorms don't mean a thing. That moving speck over on the hillside, just at the edge of the catbriars – is it just another squirrel? Or . . . it's a cottontail rabbit. Looking for a likely site to build a snug nest, probably. Down in the old raccoon enclosure a pair of Canada geese are paddling around in the black water. They nest among the yellow willows every spring; just came back today to the old homestead.

For more than a week, now, flight robins have been hanging around the Dome Cage at the corner of the Bird House and making ingratiating noises that seem to mean a great deal to their fellow robins inside the Dome.

The peacock that always haunts the hillside near the Raven Aviary is up to his old tricks again – displaying alongside the ravens. It infuriates the male raven. He spreads his wings, squawks, hops up and down. If he could just get his beak on that swaggering. . . . It's a good thing our raven never learned to talk.

Fresh paint appeared on the fence around the Riding Animals Track yesterday. The pony boys were out in their shirt sleeves, raking the tanbark into furrows in the track. In the next office, somebody just now sneezed. Bless you! Spring is just around the corner.

APR 3 '43

Dr. Beebe (in the pit) and Mr. Fleming extract the night's catch from one of the many pits they dug in the jungle floor. Opossums, spiny rats, lizards, snakes, frogs and rare nocturnal insects tumble in and are collected on early-morning rounds. If left to themselves, the strongest captives devour the weaker, and the burrowers will, in time, tunnel to the surface and escape.

Cashing Jungle Dividends

How the Department of Tropical Research Obtains and Uses Its Specimens and Facts, Linking Field and Laboratory Studies

PART I: GENERAL

WILLIAM BEEBE

An account of exactly how we go about getting facts and specimens in the jungle, and the subsequent methods of transmutation into scientific knowledge and publication has been asked for by our Editor. This is not an easy thing to do, for after forty-three expeditions many such actions and reactions cease to be conscious and enter the zone of instinct. Nevertheless, here is the tropical jungle with its challenge to us as Naturalists of a Zoological Society expedition, put in as few words as possible, dealing at most with only one or two out of hundreds of discoveries.

On our recent Venezuelan expedition the first time I stepped into a jungle trail I felt as if I had returned to an old home after twenty years of sailing over or diving into the open sea. For throughout preceding decades in British Guiana I had worked on life histories of jungle animals, and now I hoped to complete some of these.

When we entered the shade of this equatorial forest we left behind all the oil wells and pipes and comfortable camp of the Standard Company, and the last outlying thatched hut in its banana and cassava clearing was far away. Nothing of man remained except a narrow winding trail which finally led to the shore of the distant San Juan River, ending in a mudbank beloved of scarlet ibises, crocodiles and fiddler crabs. As I walked ahead I met the only human being who shared this wild region with me — a Venezuelan Indian carrying a dead agouti which he had stalked, and killed with his Alice-in-Wonderland gun. This was made of a length of gaspipe fastened to a rough-hewn stock with trigger and hammer consisting of two bits of wood released by the snapping of a pair of rubber elastics. *"Bueno,"* a quick smile and he padded out of sight.

To other men the source of livelihood is the stock market, or the purchase and resale of meat or cloth, jewelry or books, the ploughing and sowing of fields, or the extraction of milk and eggs from complacent domestic creatures. Here was my problem: From this silent expanse of giant trees, lianas, orchids and bamboos I must extract something which would satisfy my own intellectual curiosity, as well as trusting sponsors, fellow scientists, and those stayathomers who cannot travel but are eager to learn more of the wilderness life which shares this revolving planet with us.

The farmer must be alert for boll weevil or Japanese beetle, a broker worries about the effect of antipodal human activities on his stocks, the jeweler watches for thieves, while passing human fads may ruin a tailor or couturier. We are more fortunate, for four decades of experience have enabled us to relegate the so-called dangers of the jungle to subordinate attention. My daily five grains of quinine have already been taken, no thirst will tempt me to drink from the cool, clear, amoeba-filled streams, and avoidance of poisonous snakes and scorpions is automatic. Ticks and leeches are minor annoyances in this jungle, but nothing can be done about the hordes of bête rouge, until our blood sets up counteracting antibodies, when after a fortnight of grim

Tangled roots and the leafy litter of the forest floor — a typical hunting ground for the Department of Tropical Research in its work in the Venezuelan jungle. As Dr. Beebe commented: "We have only begun to solve many of the mysteries of the tropical jungle. The life which exists near, or on, or within the floor of the forest is a world in itself, with comedies and tragedies, and every creature striving with all its might to avoid danger, to find food and to perpetuate its race."

torment, all irritation will cease. We can now say that in the jungle our conscious mind is undisturbed by physical worry.

Our outfit consists of glasses, compass, gun, small net and snake bags, but our methods are far less simple than those of the old-fashioned collector. We are out for facts, for all possible knowledge of the living bird, lizard or frog, and yet these are useless without accurate identification. So we must choose when to cease observing and listening and when to shoot, unless we can return day after day and complete life histories on reliable sight identification.

Just as my oceanographic work benefitted enormously from such inventions as the bow pulpit and boom-walk[1], so here I must call to my aid other schemes than merely silent stalking. On a day when the jungle seems devoid of bird life I may suddenly feel a series of acute bites and find I have stepped into a marauding legion of army ants. Springing back and freeing myself of the furies, I plan to make use of these insects. I slowly encircle the hosts, until sooner or later, I hear a loud rustling and a medley of bird chirps and calls. Here is a golden opportunity, for all flightless animal life flees headlong from the vanguard of the ants; whereupon birds of many kinds find an unceasing supply of terrified insects, while I can observe the birds, and pick and choose at will.

A rare lizard, on this my first day, dashed over my shoe and his fear made him an easy capture. I watched three woodhewers, all new to me, all identical, so I shot one, and had to do a ballet tourjetée in order to salvage its body from the midst of the swirling mass, finding already a score of scouts of these blind demons on the plumage of the bird. The two remaining woodhewers were evidently a pair and divided their time between consumption of the rain of terrified manna and a hollow in a tall stub. I recorded their voice, expressing a half dozen emotions, unusual actions, incipient courtship and the effect of a threatening but futile power dive of a small hawk. The following day they were still there and I braved their wrath and investigated the hollow. Instead of a downy nestling I drew forth a protesting red and green tree snake with a significant bulge amidships. Subsequent investigation revealed, not an infant woodhewer but a most interesting nocturnal frog. I later found the nest of this pair of woodhewers in an adjoining tree, obtaining both an infertile egg and a nestling. Even here I was able to do more than to blow the egg and preserve the nestling in alcohol, for in the Park laboratory ultimate comparison of the syrinx or singing organ of the young bird with that of the adult gave me a hint of relationships which the organs of no two other species had furnished. Thus through previous knowledge of the army ant cosmos I was given a glimpse into the home life of *Xiphorhynchus susurrans jardinei.*

A paragraph or two in reverse brings us back to the tree snake and his last meal, and a desire to know what creatures came to life in the jungle at dusk and crept about on their occasions, both the leaf nibblers trembling at every sound, and carnivores smelling and feeling their way through the blackness toward living prey. One could spend an entire night here on the mossy floor without sensing anything more definite than a multitude of sounds and waves of scent; I know, for I have done it. Human muscles can keep quiet only so long, and the human body unceasingly gives forth a revealing odor, which to keen little nostrils is as potent as screams would be to sensitive ears.

Years ago in Ceylon I saw elephants and other animals trapped in pits and for many seasons I adapted this idea to lesser wild folk in Guiana. After my woodhewer plus tree snake plus frog incident, I returned with two husky natives complete with picks and shovels and with difficulty persuaded them to begin a series of pits, each a metre across and a metre deep, round, with vertical walls, and the excavated earth tossed far off over the jungle floor.

Pit Number One after twenty-four hours contained a motley array of creatures, a small lizard well on his way to becoming a snake, so tiny and almost useless were his legs; two of my nocturnal frogs which were so terrestrial that they were rather creepers than leapers, and only the tree snake can say what he was doing twenty feet up with one of these in his stomach; two other species of amphibians; a small spiny rat cowering in a scooped-out hollow in the pit, and lastly a rare mutillid, a large wingless wasp, gaudy in red and black fur and with nervous sting ready for action. Here was a cross section of lesser jungle night life, whose diurnal hiding places defy all search. Day after day we visited our many pits as a hunter runs his lines of traps. We could thus trace the increase and decline of various organisms as the months passed, their food, their relations to each other. Many thrived in spacious cages beneath our laboratory and contributed new facts to scientific knowledge.

---

[1] *Bull. N. Y. Zool. Soc.,* Vol 28, July, 1925, pp. 88, 90.

And so our jungle was made to pay intellectual dividends and our collections the compound interest which is the endeavor in the field of all of us on the staff of the Department of Tropical Research who serve our mother institution, the New York Zoological Society.

In our studies of the evolution of life upon earth we detect slow but invariable progress. When we come to human beings we must admit that sometimes we find conditions which are stationary or retrogressive. Almost a century and a half ago, but only twenty-five miles from where I am writing in our laboratory at Caripito, Venezuela, Baron Alexander von Humboldt wrote the following: "I cannot too often repeat, that when the seas are infested with privateers, a traveller can be sure only of the object in his own possession." Most of the natural history collections which he shipped by sea were lost by privateer attacks of various nations. Now, in 1942, the same conditions existed and I had to keep by me, or send by airplane, all notes and the most precious specimens to avoid their loss by submarines.

PART II: SPECIFIC

JOCELYN CRANE

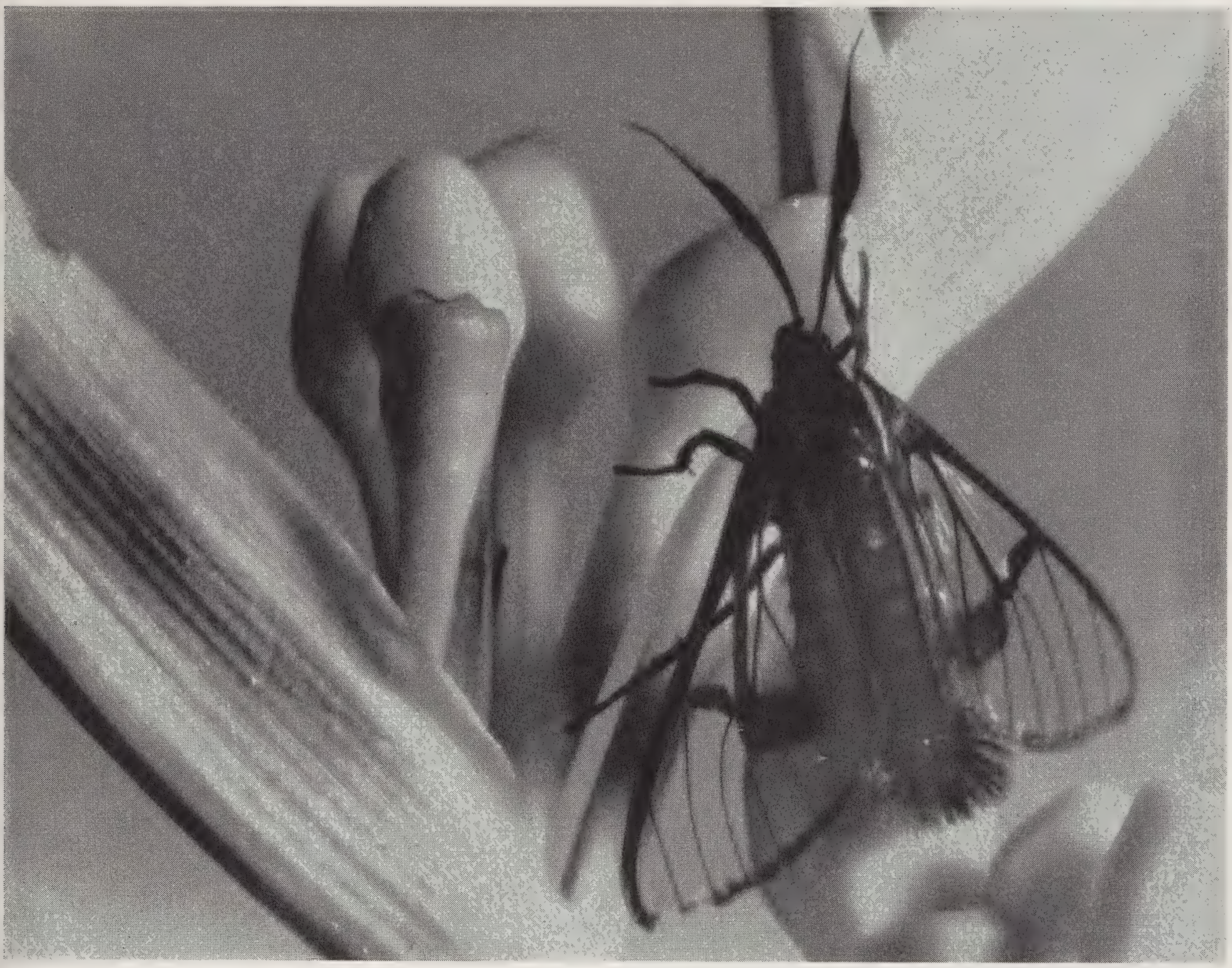
Among the above-mentioned group of specimens which we kept always with us was a large tin can full of fiddler crabs, all tied up mummy-fashion in individual cheesecloth packets, along with labels giving catalogue numbers, localities and dates. At the last moment before leaving, to comply with plane regulations, we had drained off the preserving alcohol, taping the can up quickly so that the crabs would stay moist throughout the trip. I worried considerably over that taping: it must be secure, yet readily removable by customs inspectors, and as easily replaceable, and I was quite proud of the final result. Great was my chagrin when I arrived at the Miami airport, clutching that bulky tin, to find that our inspector – doubtless wanting his dinner as much as we craved ours – disclaimed all interest in a personal introduction to our highly valued but very dead crabs.

Weeks later, when the unpacking and preliminary sorting had been finished, we sat down at our desks, face to face with rows of preserving jars and little glass vials, all full of unsolved problems. My first task was to report on this same group of custom-scorned crabs, partly because their study is directly related to a similar one made last year on related Pacific fiddlers, and partly because, with their wide variety of structure, homes, habits and courtship displays, they are among the most interesting sources of light on our ultimate problem – the workings of evolution in this and all other biological fields.[2] The immediate steps to be taken were the relating of my notes on color and habits, made by watching the crabs living undisturbed on the swampy jungle edges of the San Juan and the Orinoco delta, to the anatomical observations that could be made only by careful dissection and comparison in the laboratory. The result of this synthesis of study, after due communion with reference books and related crabs from other parts of the world, would be that every Venezuelan fiddler could be identified, described if new to science, his way of life recorded, and eventually his proper place in world-wide fiddlerdom established.

When a satisfactory family tree of all the fiddlers, which is one of our present goals, is finally completed – a tree which takes into account not only their physical differences, but also their psychological relationships – then we shall have

---

[2] Systematics and the Origin of Species, by Ernst Mayr, p. 255.



These lovely tropical moths fly about in full sunshine. There are more than 2,000 species of this group, many of them mimic wasps, bees and other stinging insects. This one was common about the Venezuelan laboratory. Its wings are transparent and the body is covered with dense fur of scarlet and black. Scientifically it is *Dinia mena*.

solved another small but important section of the evolutionary puzzle. And, as in any proper crossword, patches which we work out correctly in this one part will give clues which may lead to the solving of sections far removed.

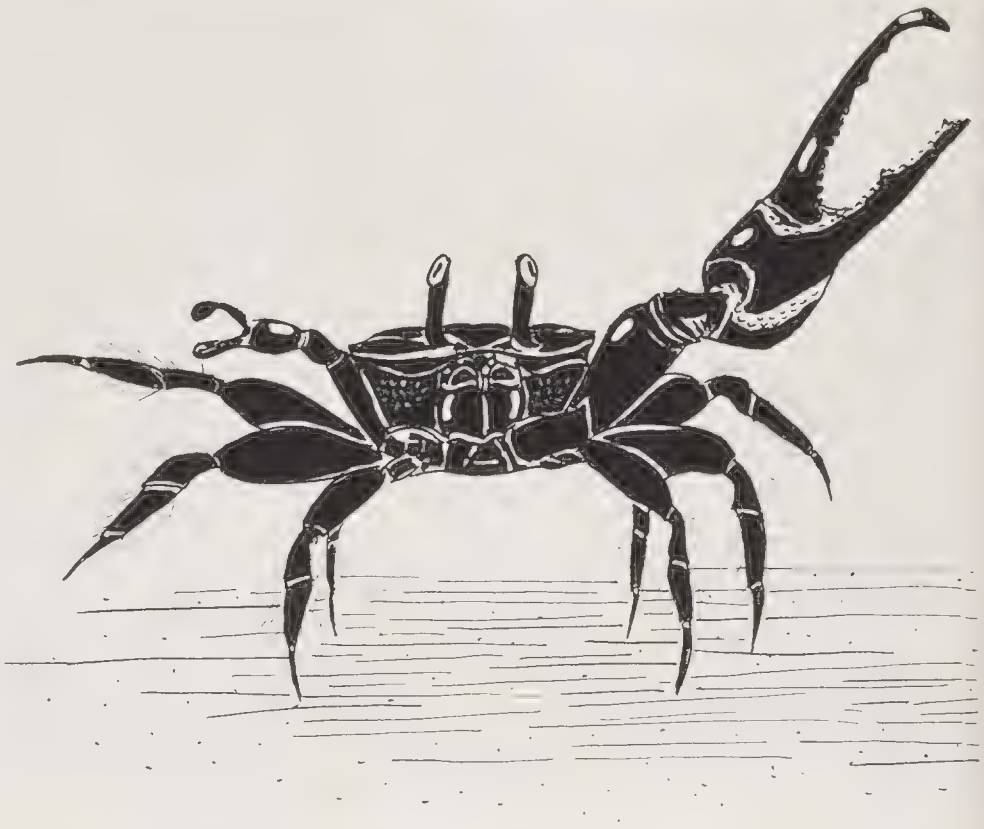
A quite unconscious example of all this was Edward, a greenish fiddler half an inch in height, who lived on a Venezuelan mud-flat down on the Orinoco delta. When I first saw him one August morning he was waving his large fiddling claw at an unimpressed adjacent female. Compared with some of his gaudy relatives, he wasn't much to look at: his claw was chiefly brownish, with only a wash of rose, and his back, although basically a lovely iridescent green, was covered except near his eyes, with mud which he never bothered to remove. Also, although he did his dance in front of a little half-domed shelter of mud, built above his hole, it was a poorly made affair compared with some I had seen, too thick for beauty and rough on the outside. Finally his display at first glance was nothing special, being only a vague beckoning underscored by a few half-hearted kicks of his walking legs. In fact his whole performance gave such an impression of comical ineptness and indecision that I named him on sight after Edward Everett Horton. (Until I could learn his scientific name in the laboratory, he had to have a field handle for practical use in notebooks, and "Edward," although highly unscientific, was certainly less cumbersome than some such title as "Green carapaced, brown-clawed, shelter-building, Group-5 *Uca*," and pleasanter and less confusing to use than a catalogue number).

Edward, by whatever name, was of interest chiefly because I knew I had never seen him before, and because he added another shelter-builder to my list. Soon, losing interest, I resumed my interrupted observation through the binoculars of another crab, a fine pearly fellow with polished apricot claw which he brandished with dramatic vigor, exactly like a great conductor at the climax of a symphony. Inevitably I dubbed him "Toscanini" and settled down for a morning's watching, between tropical downpours, of what was surely a new species.

Suddenly, however, dingy, bumbling little Edward, six inches away, claimed all my interest. A moment before, the female, who had hitherto paid him no attention whatever, but continued picking her dinner busily from the mud, stopped feeding, started watching her suitor, and finally sidled a few steps in his direction. That was the signal for Edward to speed up the tempo of his display and to add to it, at the end of every wave, a strong, triple rap of the elbow of his great crooked claw against the ground. "Rat-a-tat" went Edward in soundless vigor, and, after another beckoning wave, "Rat-a-tat." From that moment until, fifteen minutes later when he successfully persuaded the fascinated female to follow him down his hole, I never took my eyes off of them. Because in that rapping I recognized a clan-sign characteristic of a group of species quite different from the Shelter-builder group to which I had previously relegated Edward, and which I had hitherto watched only on the tropical beaches of the Pacific: Here was a crab at the mouth of an Atlantic, Venezuelan river which according to my theory, should be closely related to this Pacific group of Rappers. Yet he built a shelter like the members of the other clan! I could hardly wait to get him home and under a microscope.

So, on that November morning when I started our winter's scientific work, he was the first crab I took out of his vial of alcohol, from the cluster holding him and his brother Edwards. His field label read: "No. 42414" — meaning that he was the four hundred and fourteenth invertebrate with special notes taken on our 1942 expedition — and, "Pedernales, Venezuela, Aug. 24." He was duller than ever, and there were still traces of Orinoco mud clinging to him. So I scrubbed him gently in the sink, then settled down at last with microscope, powerful lamp, several books of references giving pictures, descriptions and keys to fiddler crabs, calipers, ruler and delicate forceps. The first necessity was to find out if he had a name other than our frivolous but convenient field soubriquet.

After tracing him through the available keys, it was obvious that he was a brand new species. In fact, no crab really closely related to him had ever been taken on the Atlantic coast. And when I examined such details of his anatomy as the tell-tale form of the serrations on his small feeding claws, counted the fifteen microscopic, spoon-tipped hairs that grew on the tip of a section of the mud-sifting apparatus far inside his mouth, and saw the shape and position of the minute arm near the end of his eighth-of-an-inch long abdominal appendage, it was clear that his closest known relative was a fiddler that lives some thirty-five hundred miles away up near the head of the Gulf of California.



In Miss Crane's field notes, this particular fiddler crab was descriptively identified as "Toscanini."

Finally, with all the anatomical evidence in, it turned out as I had guessed on that jungle mud-flat three months before from his behavior alone: Although Edward's closest relatives were the Rappers of the Pacific coast, he was more primitive than any of them. Then it was time to bring out my field notes, labeled "Edward: No. 42414," which gave a description of the kind of mud he lived in, the surrounding plants, the salinity of the water which twice daily covered his hole, the dimensions of his clumsy little shelter, detailed notes made on his evanescent courtship colors while I watched him through binoculars, similiar notes on the colors of the female, the description of his amateurish courtship display, the relative abundance of his kind compared to other species on the same beach, and whatever else I had been able to learn by watching him and his brothers through hours of observation. When these notes had been organized and typed, I compared them with similar notes I had already published on Edward's Pacific relatives.[3] Before writing the final description of his display, we studied the motion pictures made, between showers, of the crab's lazy dance.

From all of this data, combined with the now recorded details of his anatomy, it seemed evident not only that Edward was a primitive Rapper, but that this Atlantic fiddler was nearer the common ancestor of both the Shelter-builders and the Rappers than were his Pacific cousins. Those more highly evolved western Rappers wore brighter colors in display, were physically more specialized and had faster dances, of which rapping was a regular part, instead of being confined to the height of courting excitement. Added to this, the Atlantic crab built the shelter mentioned above, a custom characteristic of the other, more specialized fiddler group. It was a primitive shelter in comparison with the buildings of these higher crabs, but basically of typical form for all that.

So in Edward we had brought home not only a new species but — far more important — a true missing link, a crab living today which combined characteristics of two otherwise distinct groups of fiddler crabs. If we had not watched him fiddling and building his shelter down on the jungle shore we would never have guessed he was a Shelter-builder, for there was no anatomical hint of this habit. Hence we would never have known he *was* a missing link, which could give us a glimpse of fiddlerdom in the dim age when the Atlantic and Pacific were joined and there was no Panama.

In contrast to Edward, the flamboyant Toscanini, the neighboring crab of whom I expected such a lot, turned out to be merely a tropical subspecies of one of the most abundant of Atlantic fiddlers. The northern form scurries about on our own Long Island and Jersey shores, and was given the name of *Uca pugnax* — "the fighter" — by a New Haven professor way back in 1870. He now lives, in undistinguished obscurity, in a two-quart jar with several dozen identical companions.

Whereas Edward — dingy, unimpressive Edward — now has a special vial all to himself, with scarlet paint on his cork, showing that he is that pampered aristocrat of zoological collections, a Type Specimen — the one crab in all the thousands of his brethern upon which the original description of his species is based, and hence the standard for comparison by future zoologists who catch future generations of Edwards of dubious identity. On his label, with his catalogue number and the place he came from is his new name — *Uca* (CENSORED). (His specific name must be censored in this article, not because it might give any conceivable aid and comfort to the enemy, but because Edward's official description will not be published until later, in the forthcoming number of *Zoologica*. Should his name be first published here in *Animal Kingdom*, the few incomplete details of his appearance, given here only for purposes of illustrating our methods of research, would constitute his Type Description, to the future confused distress of my fellow carcinologists, and the just heaping of anathema upon my head. Finally, the name might even descend to the lowest rounds of taxonomy, and be branded that nomenclatural strip-tease, a *nomen nudum*).

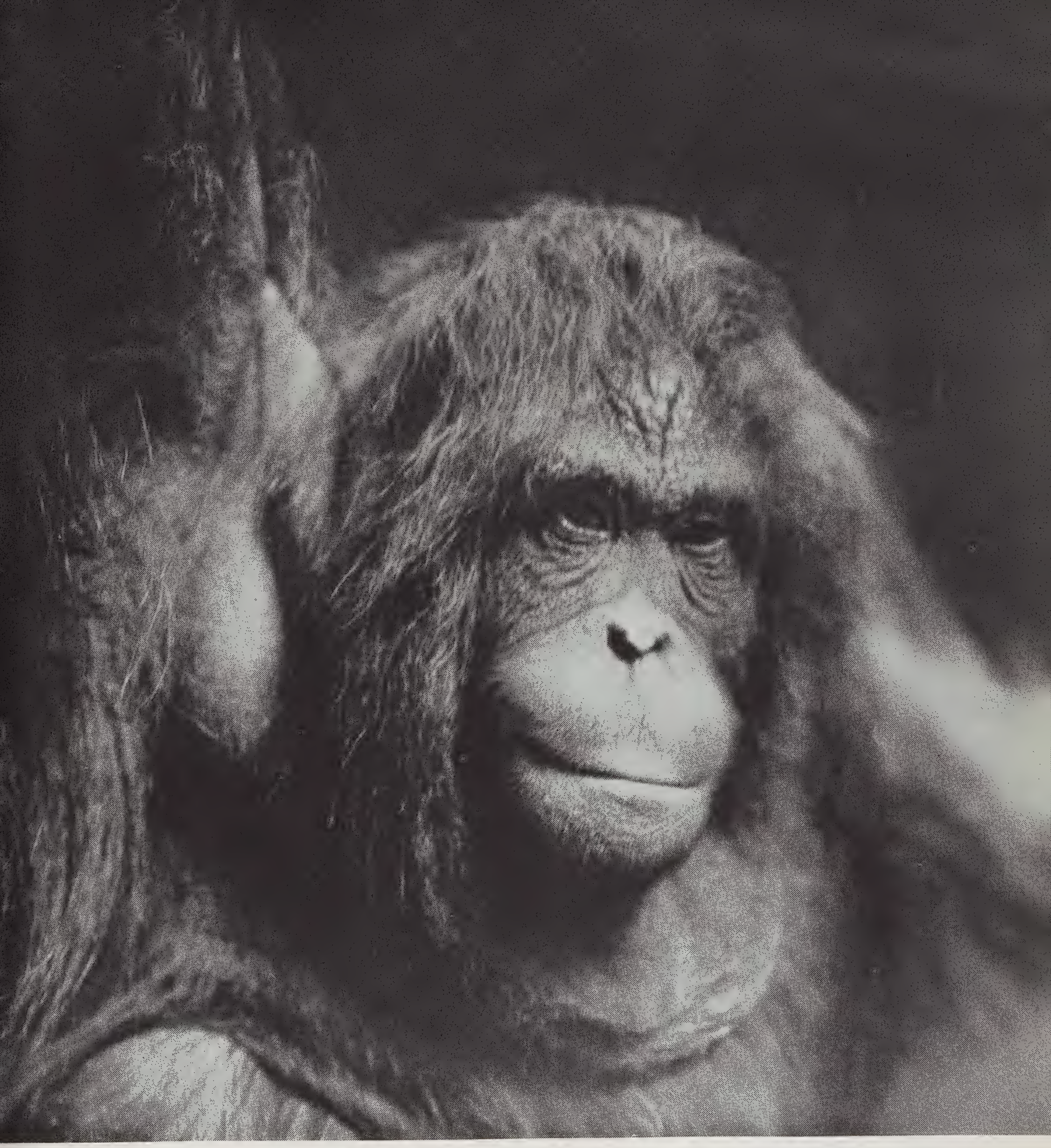
And this is "Edward," now enshrined in a bottle of alcohol as "that pampered aristocrat — a Type Specimen."

The above details of Edward's post-mortem career are presented here only because our editor thought our laboratory working methods might be of some general interest. Personally, I recommend instead that, with the first warm days of spring, you yourself hunt out the nearest quiet beach of muddy sand, sit there motionless awhile, and watch Edward's northern cousins emerge from their winter's hibernation, stretch in the sunshine, and then, very much alive once more, polish up their giant claws and start the summer's dancing.

---

[3] *Zoologica*, Vol. 26, pp. 145-207, 1941.

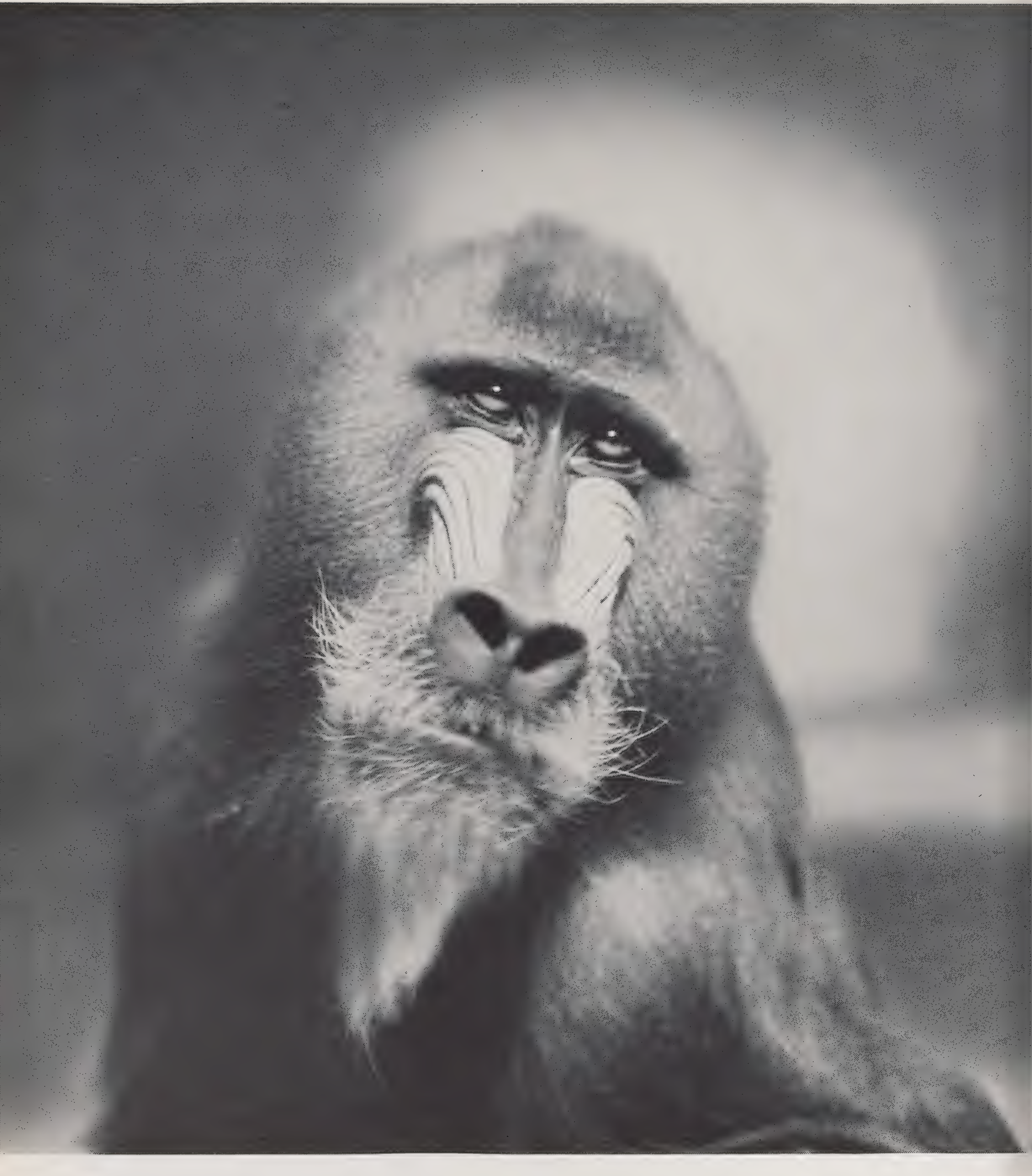
Jungle taxi in Venezuela.



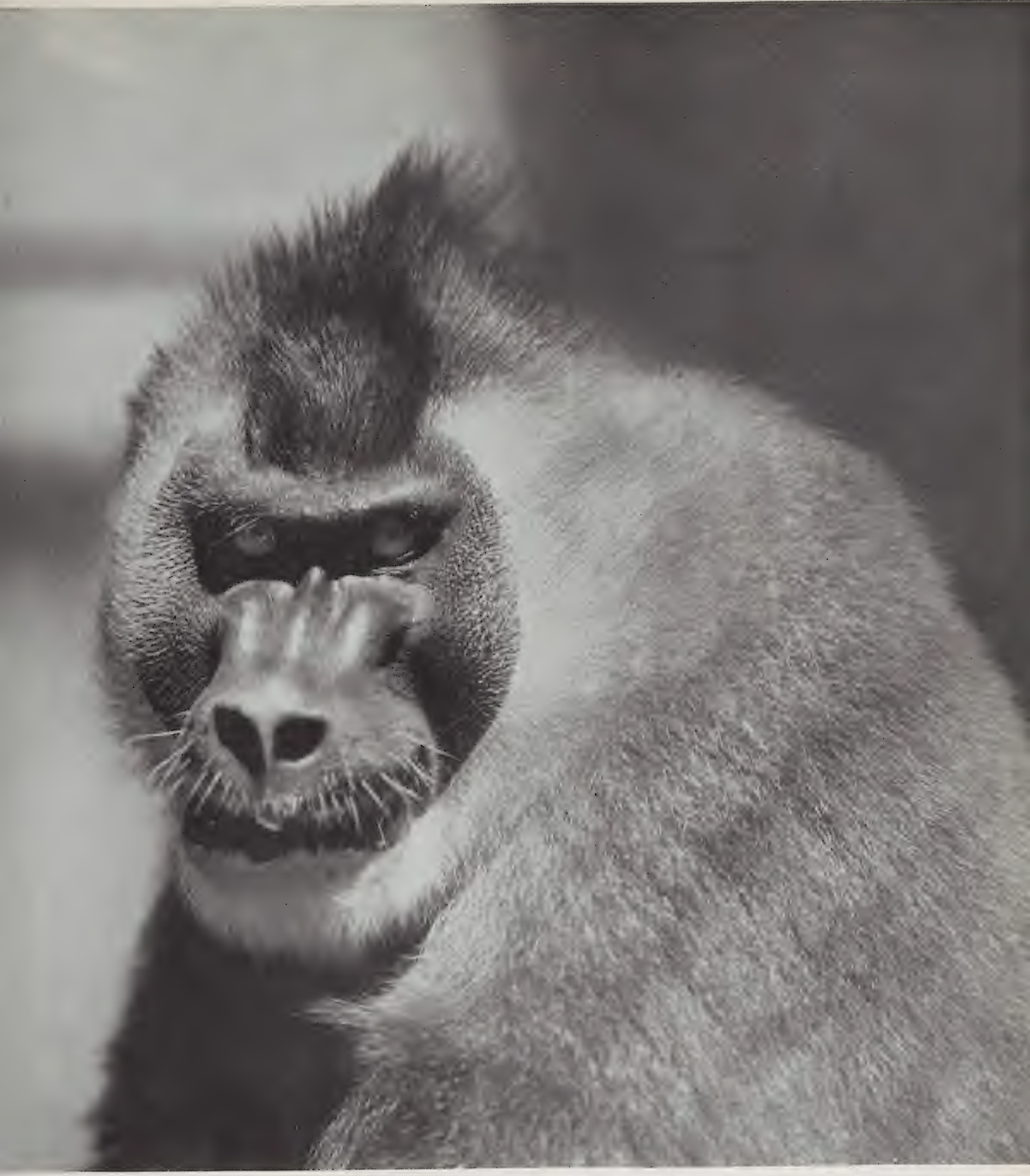
Portraits of Four Primates

It is always a temptation to anthropomorphize the primates — and it is almost always a mistake. Nevertheless, the reader is invited to let his imagination play over the features of the four primates in this collection of portraits (extracted, incidentally, from the Zoological Park's publication, "Monkey Faces.") There is a brooding and a thoughtful quality in this Orang-utan that is not found in the faces of the Mandrill, the Drill or the Hamadryas Baboon. There is even a kind of dignity. . .

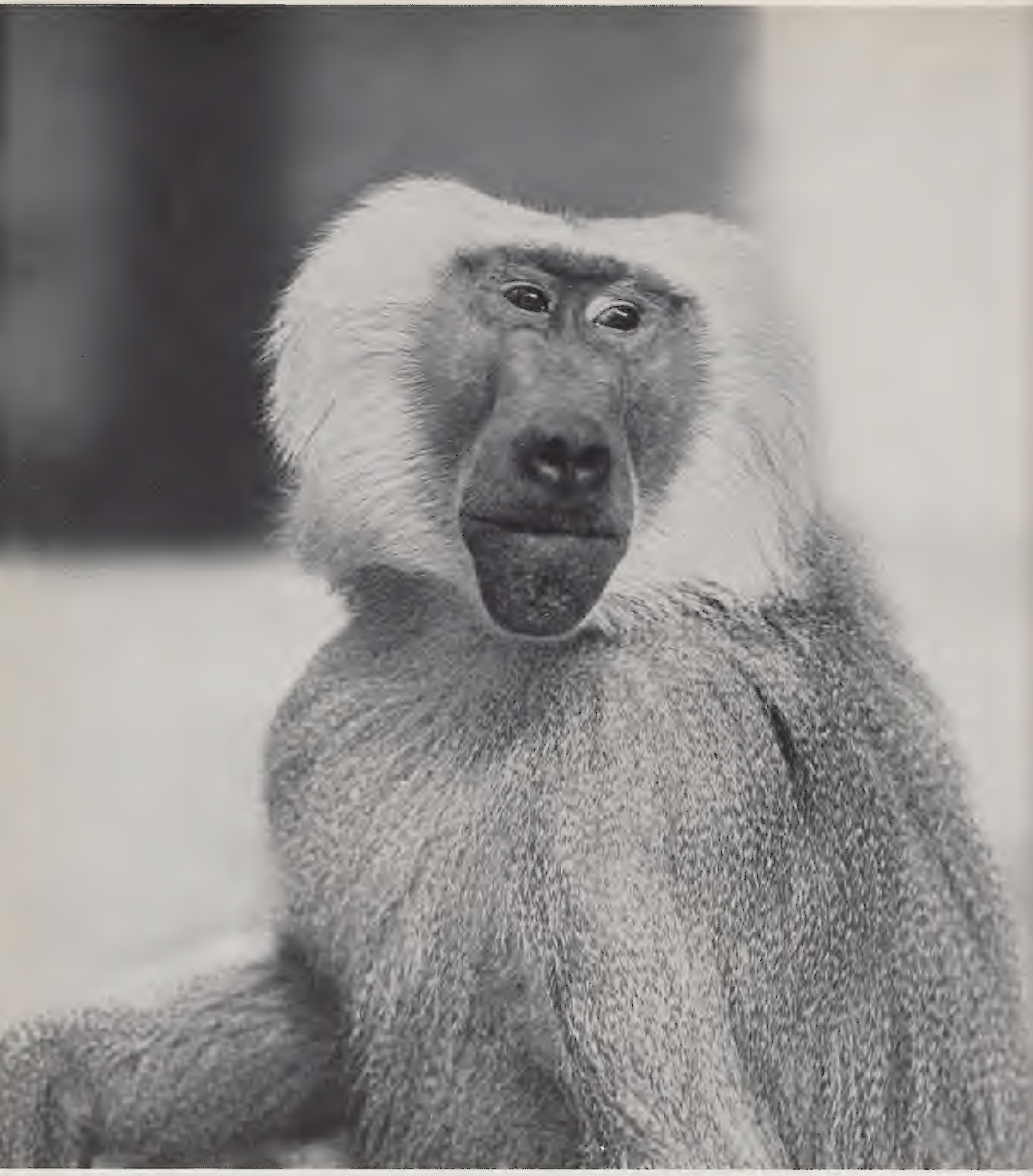
Yes, it is a mistake to anthropomorphize. Dignity there may be in Freda's face, but there was seldom any dignity in her actions. Her favorite toy was a piece of gas-pipe, which she bent into fantastic pretzels. Her favorite amusement — squirting water on photographers.



MANDRILL, a sad-eyed but ferocious fellow . . .



DRILL, a scowler even when asleep . . .



HAMADRYAS BABOON, sacred to the ancient Egyptians . . .

Homing Pigeons in Peace and War

Elaborate Training Enables This Specialized Breed to Travel Long Distances at Almost Incredible Speed

LEE S. CRANDALL

THAT HOMING PIGEONS are being used in the present war as message carriers is perhaps known to most persons. How extensive their use, and how valuable, in a war that according to one military commentator is distinguished from all others by use of the two-way radio, is something that we will not know until the conflict is ended and censorship is lifted from many phases of operations.

In the spring of 1942 the pigeoneers of the Signal Corps at Ft. Monmouth, New Jersey, captured space in newspapers all over the United States by stories of their extraordinary plans for developing an Army pigeon service. Many projects were mentioned, some practicable and others of a nature to make experts and amateurs alike raise their eyebrows. The Signal Corps' publicity department reached the peak of its ingenuity when it was announced that hawks were to be trained to strike down enemy pigeons. How the hawks were to be trained to distinguish between enemy and friendly pigeons was not disclosed.

But Homing Pigeons are being trained by the Army and presumably are being usefully employed. In England, at least, airplanes on certain types of duty routinely carry them and it can easily be imagined that the pilots would be grateful for their feathered message-carriers if their planes were forced down and their radio apparatus disabled. The military value of pigeons carried to extremely high altitudes by planes is less obvious, but experiments in high-altitude liberation have been made, and an ingenious pigeon-parachute has been devised by which the bird is enabled to drift gently down to an altitude where its wings can function properly—for at high levels the atmosphere is too rarefied for the bird's wings to get a sustaining "bite"—and at this functional level the parachute disengages and allows the pigeon to fly free.

Strangely enough, although we bred Homing Pigeons in the Zoological Park during the First World War and their exhibition attracted great interest, we have never published in the Society's magazine since World War I days any extensive notes on this most wonderful of all pigeon breeds. This article is an attempt to make up, in part, for that lack.

Not everyone, presumably, knows what a Homing Pigeon looks like—at least, how it is different from the common "clinkers" of the city streets and parks, and from the "Carrier Pigeon" with which it is so often confused.

Most persons think—and fairly enough, too—that the Carrier is the bird that flies with the messages. If it doesn't, why give it the name? It is because, in the old days, when messenger pigeons could not fly very far, almost any breed would do. The ancestors of the present Carriers were among these. Eventually the Carrier was developed for exhibition and soon became too valuable to risk at flying. For that matter, it would have been useless, for great, fleshy wattles were produced about the eyes and on the base of the bill, so that it would be quite unable to find its way about. But the name persisted, to everyone's confusion. Even the War Departments of the United States and Great Britain carry out the idea today, for the birds that are trained to carry war messages are known officially as Carrier

Pigeons — although they are really Homing Pigeons, plain and simple.

The Homing Pigeon does not look at all like the Carrier. Besides having overgrown wattles on eyes and beak, the Carrier stands much taller. The Homer is hardly more than medium-sized, not so very much larger than the common pigeons of the streets. But it is thicker and stronger in body, with a graceful taper toward the tail. The head, too, is heavier, with the beak wattle large enough to fill the space between the head and bill, giving the bird what is known as a "well filled face." There is also some enlargement of the eye wattle, or cere. These details perhaps seem hardly enough to distinguish one pigeon from another, but there is something about the Homer's manner and appearance that is more important; it looks, and carries itself, like a thoroughbred. Its lines are sharply drawn, its attitude is alert, there is a suggestion of coiled springs.

Homing Pigeons may be almost any color, as breeders pay little attention to this detail. They may run all the way from black to white, but most of them are blue, which is light slate, with two black bars across each wing; blue checker, which is the same thing with the slate of the wing covered with dark markings; or red checker, which is a mild brick color with light and dark wing markings. Sometimes there are white feathers in the wing and tail, or about the head and body. Pure white pigeons, or those with a great deal of white in the plumage, are not popular for flying because their worst enemies, the hawks, are likely to single out the light colored birds for attack.

To a pigeoneer, each bird is different from all others. Each has a distinct personality, for pigeons, and especially Homing Pigeons, differ in their mental make-up just as human beings do. Many pigeon breeders know the character of each bird as well as they know the colors of its feathers. One may be brave, another cowardly, one fierce, another gentle. All these points — and many others — are found in as many shades and variations as there are pigeons.

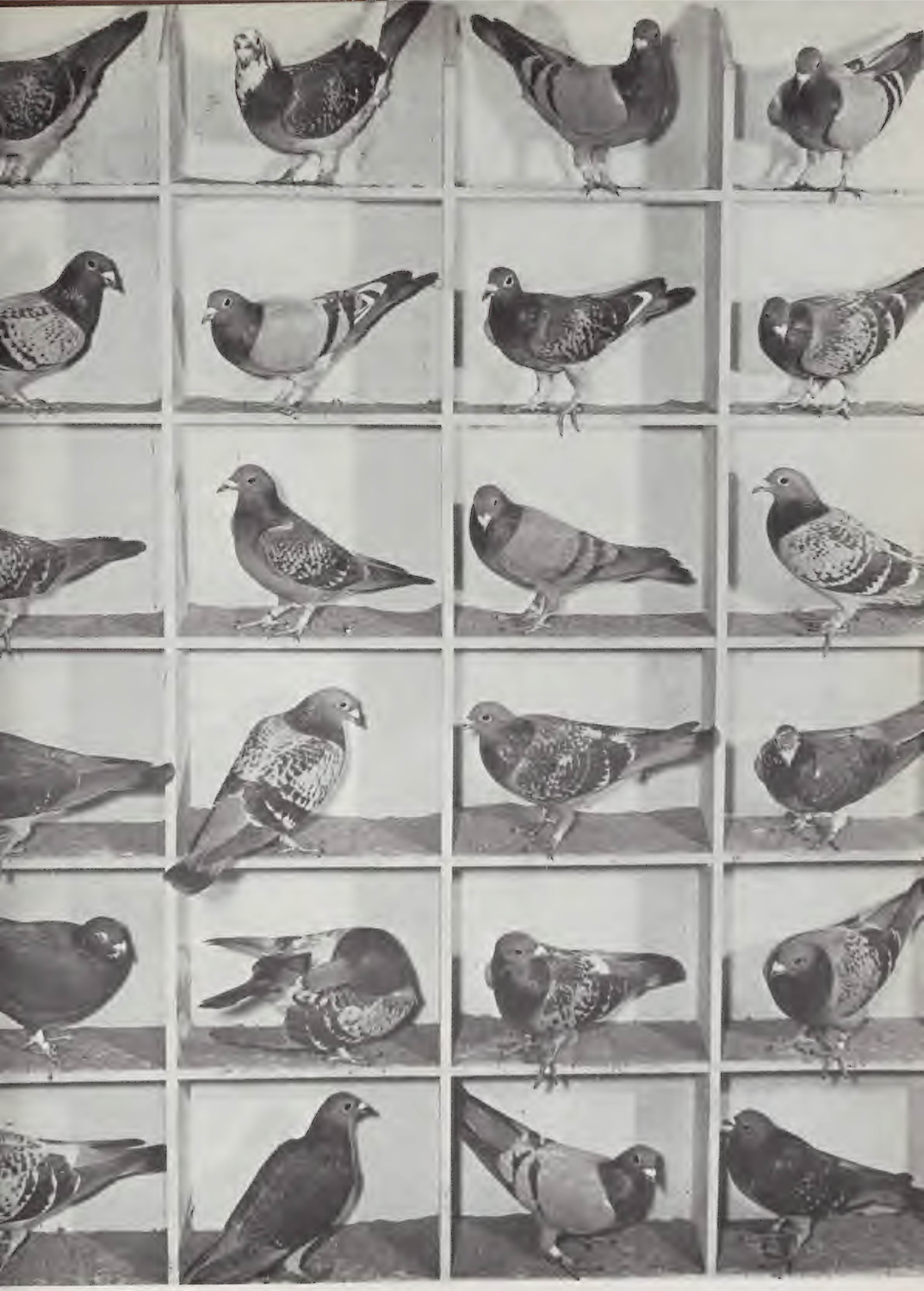
It is a common belief that a Homing Pigeon will go wherever it is sent, that the owner has only to whisper in the bird's ear! A few days spent with a Homing Pigeon fancier during the spring training season would quickly disabuse anyone of *that* idea. The training of Homing Pigeons is a long and complex business.

A pigeon flies only to its home; after all, that is why it got its name. One might suppose that constant practice would enable it to fly home straighter and with greater speed. Such is the case, and the object of the elaborate training.

Young Homing Pigeons, if allowed to fly freely about their lofts, will cover a distance of several miles in each direction, but never getting very far from home. When they are about three months old, the owner takes them perhaps five miles away and lets them go. Even though their own wanderings have taken them to the same spot before, they always circle a few times, going higher and higher, until they are certain of the right direction. Once this training is begun, it is continued at intervals of two or three days, at constantly increasing distances. If the birds are to be used for racing, training stops at about fifty miles, and they are sent directly into the first race, usually at seventy-five or one hundred miles. If the weather is favorable, pigeons of good breeding fly this without difficulty. Young bird racing usually ends in October, with three hundred miles, although even five hundred are sometimes flown. All through this racing period the contestants receive the very closest attention from their trainers. Their condition is watched constantly, and any that have lost weight are withheld from the daily flying exercises between the longer flights. They are fed carefully on the choicest grains, especially beans, peas and tares, which are known as makers of muscle. Race horses receive no better and no more skillful training than racing pigeons.

In following years when the young pigeons have become matured and have families of their own, racing is continued at greater distances. It begins in spring, usually about the first of May, and continues until July, when it is checked by hot weather and the beginning of molt. When pigeons are renewing the long feathers of the wings, they are too greatly handicapped for flying. Old bird racing begins at one hundred miles, continuing regularly to six hundred and one thousand, though special contests are sometimes arranged at longer distances.

The speed at which Homing Pigeons fly is



Homing pigeons in the loft of the Signal Corps at Fort Monmouth, New Jersey – an extraordinary photograph taken by David B. Eisendrath, Jr.

largely determined by weather conditions. They are likely to become completely lost in fog, are hampered by rain or head winds, may become exhausted if heat is extreme and do not like flying over mountains or wide expanses of water. What they like best is a fairly level course, with cool, clear weather and light following winds. Then they may fly at very high speeds. In 1900, an American pigeon flew one hundred miles at the rate of 2,511.87 yards—nearly a mile and a half — per minute. What was once the world record for 1,000 miles was made by a pigeon named "Bullet," owned in Fort Wayne, Indiana. Bullet flew this distance in one day and eleven hours, time out being allowed for hours of darkness, when pigeons do not fly. This time was not exceeded until 1927 when "Wayne Junior," again a Fort Wayne bird, beat it by a full hour. Such speed over long distances is not possible in Europe, because in countries where pigeon racing is practiced, courses cannot be found that are clear of tall mountains or wide water jumps.

As to how far a pigeon may be sent and still manage to get home, there is some doubt. There are tales of long flights over the ocean and of returns from distant South America. But since there was no official control in these cases, one may accept them as authentic, or not — always remembering that the owner, himself, may be mistaken.

However, proper races have been flown successfully to this country from Havana. This is the more extraordinary when it is remembered that pigeons have an aversion to crossing water.

One long distance record is officially established. This was made by a pigeon that flew from Denver, Colorado, to Springfield, Massachusetts, a distance of 1,689.44 miles. Twenty-two days and three hours were required, showing that the bird worked its way slowly along, stopping for food and water wherever it could find them. While the time certainly is not remarkable for speed, it is a striking example of the stamina and persistence of the Homing Pigeon.

It is sometimes difficult for the uninitiated to understand how there can be a real race between pigeons when the competing birds may be flying home to lofts miles apart, although they all start from the same point. It is all done in "yards per minute."

A surveyor establishes the distance from the point of liberation to each loft — and it is important to have the same surveyor make all the measurements, for otherwise there might be discrepancies. Each pigeon wears on one leg a narrow band of aluminum, bearing letters and numbers, placed there when it was six or seven days old. As the bird grows, the band will no longer pass over the toes, so that the mark is permanent. When pigeons are sent into a race, a numbered rubber band is placed on the other leg and the aluminum and the rubber numbers are recorded. Each owner has a special clock, so arranged that when a pigeon arrives the rubber band may be placed in it and the time recorded to the second. Figuring from the time of release, the clock shows how long the bird was in the air. Since the exact distance between the point of liberation and the loft has been established by survey, the average "yards per minute" is easily figured and the winner of the race can be determined.

All this talk of wonderful flights and dazzling speed naturally brings up the question: How do they do it? Most people who know little of Homing Pigeons, and even some who know a great deal, think that it is done by a mysterious "sense of direction." But even those fanciers who believe in this special "sense" do not rely on it when they prepare their favorites for racing. They train their birds by short, easy flights. They know well enough that even the very best pigeon cannot be relied upon to fly any great distance unless this is done. On the other hand, there is the fact that only the most carefully bred Homing Pigeons will go through this course of education. Pigeons of other breeds may find their way home from distances of a few miles. Half-bred Homing Pigeons have been known to fly one hundred miles. But this is an unusual feat and at greater distances such birds would almost certainly be lost. So, until this "mystery" is really solved, we shall have to satisfy ourselves by saying that, while the Homing Pigeon does seem to have some sort of ability missing in other pigeons, elaborate training is needed to develop it.

Newest Animal—the Kouprey

The Indo-Chinese Forest Ox Was Given a Scientific Name Only Six Years Ago and a Single Specimen Has Been Exhibited

WILLIAM BRIDGES

HAVE all the large animals of the world been discovered? More than forty years ago zoologists would have answered the question with a reasonably secure "Yes" — but then Sir Harry Johnston found the Okapi living in the Ituri Forest of the Belgian Congo.

In 1912 came Ouwen's published description of the Komodo monitor, the ten-foot "dragon lizard."

And as late as 1937 Prof. Achille Urbain was able to make known so large a creature as a wild ox, nor was it a mere race or form of some previously known species. *Bos (Bibos) sauveli,* known to the natives of Cambodia as the Kouprey, or Kouproh, was described as a full new species — even as belonging to a new genus.

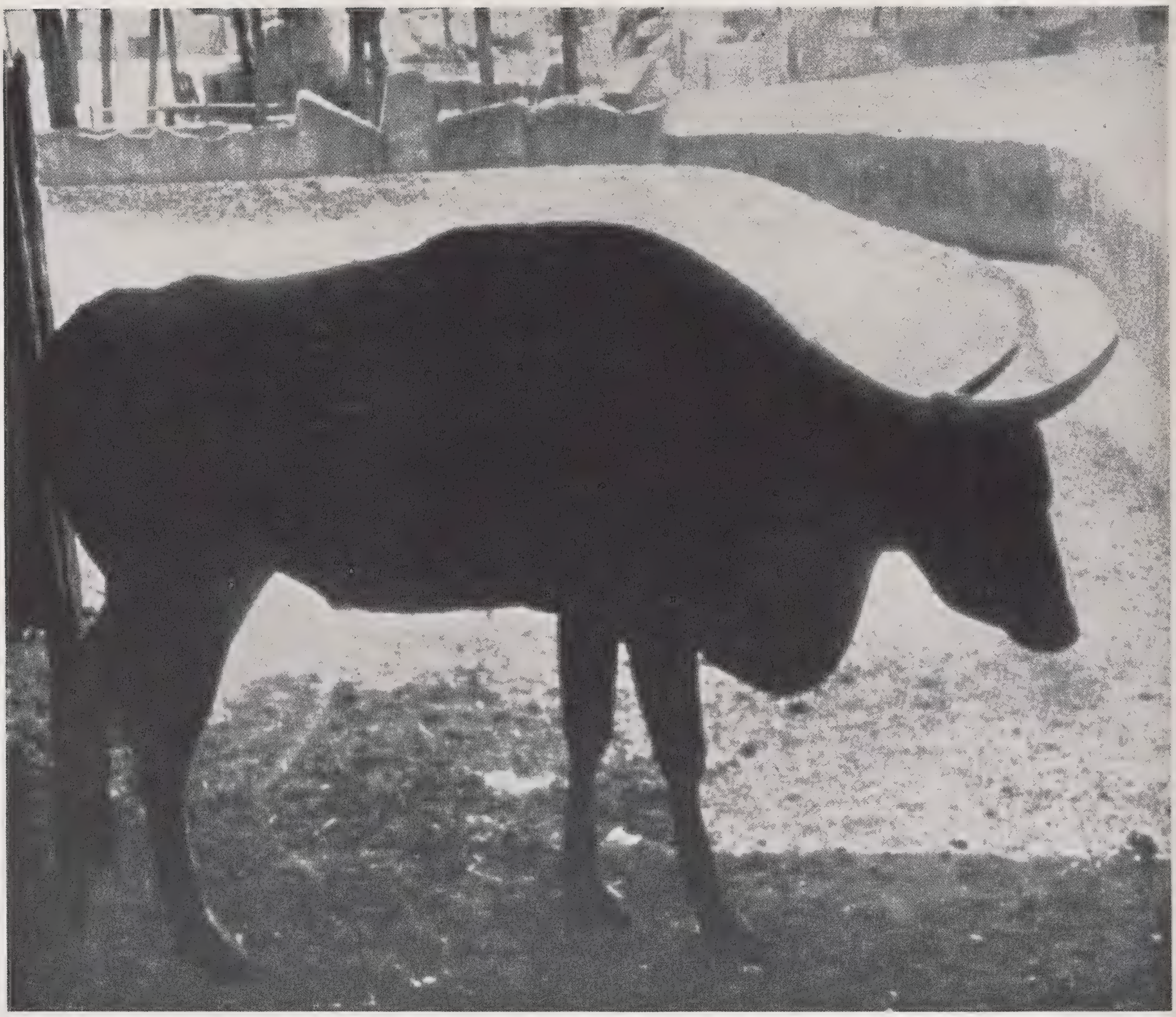
Only one specimen has been seen in captivity. In July of 1936 a young Kouprey was captured near Tchep in North Cambodia and was presented to the Vincennes Zoological Garden in Paris. There it lived peacefully, part of the time as companion to a young relative, the Gaur, until it was mysteriously poisoned in the spring of 1940. The photograph on the following page hardly does it justice but it is the only picture available and is reproduced from the elaborate paper on the Kouprey published as Vol. LIV, No. 6, of the Memoirs of the Museum of Comparative Zoology by Harold Jefferson Coolidge, Jr.

Captain Jean Delacour, who was the leader of the Indo-Chinese Expedition in 1938-1939 during which an adult Kouprey was collected, recalls that the young animal at Vincennes — about four years old at the time of its death — was placid enough when it arrived, but had begun to show an uncertain and dangerous temperament at the age of four years.

So recent is the discovery of the animal and so little field work has been done in Cambodia that almost nothing is known about the life history of the Kouprey and nothing, actually, about the cause of a curious and distinctive feature of the animal's horns. This is the ragged fraying of the horns near their tips. Mr. Coolidge comments that this "seems to be characteristic of the bulls although we know nothing as yet about the actual horn conditions in the cow Kouprey. The fraying is undoubtedly caused by some habit of the Kouprey which involves digging with or scraping the tips of the horns . . . It is a curious fact that extensive fraying of the horns is not to my knowledge associated with any other of the living Bovidae."

In size the Kouprey stands between the Gaur, largest of the world's wild cattle, and the Banting. Its coat of short, glossy hairs is blackish brown, the tail is long and bushy-tipped and the dewlap is unusually large.

Presumably the Kouprey has been known for a very long time to the natives of the Cambodian forests which are its only known home, but no printed reference was ever made to it until 1930 when a hunter-guide named Defosse referred to it in a pamphlet issued to attract sportsmen. Subsequently a few specimens were shot, but the species was not recorded in the scientific literature until 1937 when Prof. Urbain, director of the Vincennes Zoo, published a description of it and named it *Bos (Bibos) sauveli* in honor of Dr. Sauvel, the official veterinarian of North



A silhouette photograph of the only specimen of the Kouprey that has ever been exhibited alive—the 3½-year-old male that was for a time in the Vincennes Zoo in Paris. Not long after, the Kouprey was poisoned.

Cambodia who had shot a number of the animals and had made a series of measurements. It was Dr. Sauvel, incidentally, who captured the young Kouprey for the Vincennes Zoo.

Still later, in 1940, Mr. Coolidge made a thorough study of an adult specimen shot by M. François Edmond-Blanc of Captain Delacour's expedition and as a result decided that it was worthy of being placed in a new genus, which he called *Novibos*. Not all mammalogists are agreed, however, that the Kouprey deserves such distinction, and prefer to place it in the genus *Bibos* together with the Gaur and the Banting — certainly its near relatives and its neighbors in French Indo-China.

Perhaps the New York Zoological Park will someday have the good fortune to exhibit a Kouprey. However, the area known to be its home is remote and transportation is difficult. Nevertheless, one specimen *has* been brought out, so that the Vincennes Zoo was able to exhibit side by side this most primitive of the wild cattle as well as the related Gaur and Banting. After the war, who knows . . .?

One estimate places the possible number of living Kouprey at a thousand head, but since the limits of its range are not known and may well be greater than is now believed, it is to be hoped that this "newest animal" is not also one of the world's rarest.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

LONGEVITY OF BATS

The last of the Vampire Bats that have been an interesting feature of the collection for some years died several months ago, and a search of the accession cards shows that extraordinarily good longevity records were established for a few specimens. One bat lived for six years, three months and seventeen days.

Vampire bats which lived more than one year in captivity were the following:

Desmodus rotundus rotundus

ARRIVED	DIED
Sept. 1, 1934	Jan. 19, 1937
Sept. 10, 1934	Jan. 8, 1936
Sept. 10, 1934	Dec. 27, 1940

Desmodus rotundus murinus

ARRIVED	DIED
Dec. 16, 1934	Aug. 15, 1938
Dec. 16, 1934	May 6, 1936
Dec. 16, 1934	Aug. 12, 1940
Sept. 20, 1941	Sept. 24, 1942

Food was no obstacle in the maintenance of the Vampires; they consumed only fresh blood, defibrinated, which could be obtained twice a week from a local slaughter house. Almost complete seclusion was found to be highly necessary, however, and the bats that survived over any considerable period were those which were never actually placed on exhibition, but were kept for study in a cage of their own in the feed room of the Reptile House. — W. Bridges.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since last issue of this magazine are the following:

Life

S. R. Lindboe

Annual

Mrs. Fred Gordon Blackstone
Dr. E. Burke
Harold H. Helm
Pvt. W. Clark Self
Mrs. Mary Stevens
Dr. Edwin G. Van Valex
Frederick Walz

Junior

Donald Sherwood Aiken
Kenneth Bobrowsky
Dorothy Carlson
Jules M. Crane, Jr.
Mary Schmid
Charlotte Scofield

CRISIS AT THE FARM

The manpower problem, much discussed nationally in recent weeks, struck home at the Farm-in-the-Zoo in March when Farmer Aaron White, who has been in charge of our rural exhibit since its opening last summer, was notified by his draft board that he would be inducted into the Army on April 15.

Attempts to find another farmer to replace Mr. White had come to nothing when the New York *Herald-Tribune* in mid-March printed a cleverly written story calling attention to the crisis. As a result, the Zoological Park was swamped with applications for the job during the next few days. Altogether Dr. Leonard J. Goss, who is in charge of the Farm, received 49 letters, interviewed 29 persons (including 12 women), and received literally scores of telephone applications.

One would-be farmer admitted that he was 84 years old but felt that he could still handle any farm job that came along. Another was a former taxicab driver, retired from service because he was losing his sight. One girl of 16 applied, stating as her qualifications that she had reared chickens in a back yard in Brooklyn. A woman claimed intimate experience with farm work for two years, but was rejected summarily when she said she milked a cow from the left side!

Dr. Goss eventually selected Mr. Joseph Kane, 46 years old, a retired New Hampshire farmer who had moved to Rockville Center, L. I., two years ago because his family wanted a taste of city life.

"We've all had enough of it and we want to get back to a place where there's a cow," Mr. Kane told Dr. Goss.

* * *

The Children's Zoo and the Farm-in-the-Zoo will open their gates for the new season on April 1.

* * *

Early spring brought some rare visitors to the

Wildfowl Pond and the Bronx River — several Goldeneyes, Greater and Lesser Scaup, Hooded Mergansers and American Mergansers.

THE GORILLAS GROW UP

Our two young Gorillas are beginning to grow out of the stage of harmless babyhood. Their strength has developed until thick plate glass is no longer safe under the pounding of their playful fists.

When the routine monthly weighing on March 1 revealed that Oka, the female, weighed 54 pounds and that Makoko was now 71 pounds, General Curator Crandall became alarmed about the indestructibility of the glass that separates the two animals. Both have a habit of pounding on it and bumping against it.

While the glass was being removed and a heavy wire screen set in its place, the male Gorilla explored a corner of the female's compartment, found a pane of glass that was not wire-reinforced, and promptly cracked it.

Then the female took up the pounding and broke a sheet of glass. Both animals were immediately locked up in shifting boxes while workmen installed wire screen guards in front of all glass. Visibility of the two animals is somewhat reduced, but their present quarters at the north end of the Lion House are only temporary and it is hoped that by early spring they can be transferred to their roomy new home in the renovated Primate House.

Makoko was inclined to be aggressive and distrustful of everyone when he first came to the Zoological Park on September 7, 1941. That attitude he has almost entirely lost, although he is still suspicious of the scales used to weigh him each month. Oka willingly climbs on the scales and sits still while her weight is being recorded; Makoko is afraid of the wabbling motion of the platform and cannot be induced to go near it. Keeper Reilly solved that small problem by taking Makoko on his back and standing on the scales himself, subsequently deducting his own weight.

RED FLAMINGOES

Our efforts to retain something of the brilliant scarlet natural to the plumage of the American Flamingo in the wild state, have involved us in a maze of comment and inquiry, varying from mere interest to actual suspicion. We have been covertly, even sometimes openly, accused of withholding scientific discoveries of cosmic value, or of secretly applying crimson dye to otherwise faded feathers.

Actually the truth lies short of both accusations. We have applied no dye, nor have we made any startling discoveries. On the other hand, we have succeeded in wintering our ten Flamingoes, of three species, in really superb condition, a feat which in itself is unparalleled in our experience. Moreover, when the birds emerge from winter quarters, somewhere about April 1, our three birds of the American form will carry a plumage of a brilliance never seen here before.

No secret formula is involved. The whole process has been purely empirical and just how the change has been accomplished, we still do not surely know. We only know that we used every food item known to us that might give the necessary oils and vitamins for the production of the coveted pigment, limited only by the rather peculiar and fastidious feeding habits of the birds.

During the winter their diet has included the following items: whole wheat, soft and white; dog biscuit; boiled rice; sweet peppers, grated fresh daily; raw carrots, finely ground; fresh shrimp; codliver oil and brewer's yeast. Somewhere in this list is hidden the unknown element which has given us at least a share of what we seek, and also the bloom of obvious well-being. Our Flamingoes may not be as brilliant as those of Andros Island, but they are definitely red and delightfully healthy. — L.S.C.

FORTHCOMING SPECIAL EXHIBITS

An interesting schedule of special exhibits has been arranged for the Heads and Horns Museum Gallery in the Zoological Park during the spring and summer.

On April 3 a series of colored photographs of animals, by Mr. S. Carleton Simonson of White Plains, will open and continue until late May.

Following the Simonson show, Dr. William Beebe will recreate some of the atmosphere of his recent Venezuelan expedition, by means of photographs and exhibits of the equipment carried on the trip.

The drama of flags against a March sky has been caught by Robert Coope in this photograph of Baird Court. At either end, the Zoological Society's banners; flanking the American flag are the flags of New York State and City.

"The exhibit will," Dr. Beebe explained, "attempt to answer some of the questions we are asked after we come back from a field trip — "What is the jungle really like? Is it as dangerous as we hear it is? How do you keep well? How do you find and catch your specimens? How do you watch them and take notes?"

Some of the answers to those questions are, of course, answered in this issue of Animal Kingdom, in "Cashing Jungle Dividends," the article by Dr. Beebe and Miss Crane.

Another exhibition already scheduled is one of news photographs of animals in the Zoological Park, taken over a period of several years by Arthur Sasse of International News Pictures, one of the most skillful news photographers in New York. This exhibition will begin July 3 and continue through August 15.

PUBLICATIONS OF INTEREST

HANDBOOK OF FROGS AND TOADS. The Frogs and Toads of the U. S. and Canada. By Anna Allen Wright and Albert Hazen Wright, Comstock Pub. Co. Inc., Ithaca, New York, 1942; xi-286 pp., 88 halftone plates, $3.00.

Twenty-five years ago at the Zoological Society's research station in British Guiana, I first became acquainted with the marvelous frogs and toads of the South American jungles and with one of Dr. Albert Hazen Wright's excellent batrachian papers. In the swamps and streams, on the jungle floor, and high among the forest trees about the laboratory were strange amphibians; harlequin frogs, *Dendrobates,* who carried their tadpoles on their backs from pool to pool whenever the dry season threatened to desiccate their childhood homes; Surinam toads, *Pipa,* whose females transport their tadpoles in pockets in the skin of their back, and dozens of other colorful and astounding tree-frogs about whose life histories we could not even guess. Frogs' eggs and tadpoles were abundant and found in all sorts of surprising situations, and for guidance in absorbing the interesting batrachian activities that were all about us, we turned to Dr. Wright's "Life Histories of the Anura of Ithaca, New York", published in 1914, as a model of how a batrachian life history should be treated.

In the present volume, which is based on the similarly named 1933 edition, the Wrights have produced another model of a concise identificational and informational volume on frogs and toads. As a rule, each of the 98 species and subspecies of frogs and toads now recognized from the United States and Canada, are treated on two facing pages, each account containing common and scientific names; range and habitat; size and general appearance; structure; voice, breeding and transformations; plus field notes based on the authors' experiences and on accounts of other herpetological authors. A panel of photographs is given for most of the species, showing not only adults but eggs and growth stages whenever possible. Excellent keys to the genera and species, adequately explained by convincing diagrammatic figures, make the book easy to use, while a good bibliography is available for the student of local faunas. This is a volume to be recommended for the scientist or amateur student who is interested in the delightful, droll creatures of our swamps, streams, lakes, and fields that are known as frogs and toads. — J. TEE-VAN.

THE BIRDS OF BRITAIN. By JAMES FISHER. 48 pp., 12 illus. in color, 26 in black and white. William Collins, London, 1942.

As one who has always been just a little amused by the frequent reference in literature to "British birds," as if a whole avifauna were the exclusive possession of our ally (a typical specimen would be the John Bullfinch), I read Mr. Fisher's book with interest. He is one of the statistically-minded younger ornithologists, and reports that 33 of the 133 breeding resident birds of Britain are peculiar to the island. There are, it seems, truly British birds. I can smile no longer at the phrase.

"The Birds of Britain" is a handsome little book, well illustrated in color and black-and-white with plates taken mostly from the famous artist-ornithologists of the past. The text briefly summarizes the history of British birds, the changes taking place in the avifauna and the methods of observation that have contributed so importantly to a knowledge of British bird life. This volume is one of a series of books called "Britain in Pictures."— W. BRIDGES.

TRAIL OF THE MONEY BIRD, by DILLON RIPLEY. Harper & Brothers, New York and London, 1942. 305 pp., 18 illus., $3.50.

The "Money Bird" is the King Bird of Paradise and the "Trail" includes much of northern New Guinea and adjacent islands. Incidental are more than a few thousands of intervening miles that must be crossed and crossed again in such a journey.

Whether the "Money Bird" is so named because of its one-time value in the plumage trade or because of the shining disks at the tips of the two middle tail feathers, Mr. Ripley does not say. But he does say many other things, in a style so light and gay that the life of a naturalist-explorer seems filled with joy and fascination. Some of the experiences recounted must have taxed this young writer's ability to maintain a humorous approach but nevertheless he has succeeded in doing so. The book is readable and entertaining throughout, and is so strongly implanted with grains of information that it is definitely instructive as well.

A great deal of excellent natural history observation, usually artfully concealed, is contained in these pages and one, at least, astonished this reviewer. It is a reference to the "sickle-bill" which, by a process of deduction, may safely be taken as a form of *Epimachus,* a genus of large birds of paradise. At the close of its courtship display in a tall tree, the male was seen to make a "nose dive" for fully one hundred feet, check on spread wings and sail back to its perch high above the ground. Birds of paradise, for the most part, are not powerful fliers and the recording of such a performance is an achievement in itself.

The final chapter is devoted to a homeward journey around the Cape of Good Hope, with a varied collection of living specimens. Several of these creatures found a place in the New York Zoological Park and are still to be seen here. — L. S. CRANDALL.

Going to the Country? . . . THEN YOU OUGHT TO HAVE

SERPENTS
of the Northeastern States

By RAYMOND L. DITMARS

There are many books about the identification of our local snakes, but this is still the simplest and in many ways the most practical for the layman who wants to know enough about snakes to keep out of their way!

It tells —

What snakes are found in the Northeastern States
Where they are most likely to be found
What to do if you are bitten by a poisonous snake
How to identify the local snakes
What they look like—PHOTOGRAPHS OF EVERY ONE OF THEM
What they eat

If you aren't sure you would know a Copperhead—or even a Rattlesnake—if you saw one, there are accurate pictures in color of both these snakes.

60 pages, 41 illustrations *50 cents postpaid*

DEPARTMENT OF PUBLICATION
Zoological Park, Bronx Park
New York City

XLVI • No. 3 MAY–JUNE 1943

0.673
A57

ANIMAL KINGDOM

BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

BEEBE LOOKS A LONG WAY AHEAD • WHAT TO DO ABOUT BABY BIRDS,
e S. Crandall • ANCESTRY OF OUR DOMESTIC CATTLE, *by Claude W. Leister* • NOTES

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field
De Forest Grant
Warren Kinney
William De Forest Manice
David H. McAlpin
Robert Moses
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Eugene Holman
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert I. Gannon
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van . . . . *Executive Secretary*
Jean Delacour . . . . *Technical Adviser*
William Bridges . . *Editor & Curator, Publications*
Sanford Miles . . . . *Comptroller*
Claude W. Leister . . . . *Curator, Education*
Donald Marcy . . . . . *Associate, Education*
Millward W. Heath . . . *Supt., Construction & Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*
Claude W. Leister . . . . *Associate, Mammals*
John Tee-Van . . . . . . *Associate, Reptiles*
Leonard J. Goss . . . . *Veterinarian*
Harry C. Raven . . . . . *Associate, Anatomy*
Grace Davall . . . . *Assistant to General Curator*
W. Reid Blair . . . . . . *Director Emeritus*
William Beebe . . . . *Honorary Curator, Birds*

AQUARIUM

Charles M. Breder, Jr. . . . . *Director*
Christopher W. Coates . . . . . . *Aquarist*
Ross F. Nigrelli . . . . *Pathologist*
Myron Gordon . *Research Associate in Genetics*
George M. Smith . *Research Associate in Pathology*
Homer W. Smith . *Research Associate in Physiology*
Charles H. Townsend . . . . *Director Emeritus*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*
Jocelyn Crane . . . . . . *Research Zoologist*
Henry Fleming . . . . *Entomologist*
George Swanson . . . . *Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE
NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVI JUNE 11, 1943 No. 3

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York, N. Y. Title registered with United States Patent Office.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

The Cartoonists' Gorilla

Why should one of our well-known cartoonists pick on the Gorilla? The practice of using animals to characterize the lowest traits of human nature sometimes goes almost too far.

In a recent cartoon, dealing with the execution of American fliers by the Japanese, a Gorilla was used to represent the "murderers." The cartoonist may well be forgiven for his ignorance of the fact that these animals live only on a vegetarian diet and that they are quite harmless in their natural state either to man or to other animals, except when called upon to defend the members of their immediate family group. There is no intention here to glorify Gorillas, yet one pauses to wonder how long man must persist in keeping alive the shibboleths and superstitions of the dawn days of the human race. Or, are we humans attempting to justify our shortcomings by implying that they are due to our inheritance from nature?

As to the common belief that nature is a condition of "hunt or be hunted," "kill or be killed," it is a striking fact that when all of the larger and higher types of mammalian animals are considered, the carnivores, namely those who live upon the lives of others, are merely outliers among the great animal populations—a minority party indeed! In fact, it is estimated that the number of carnivores would not exceed one percent. of the total animal populations as they originally existed in Africa, or in North America—that is, before man decimated the wild life of these continents.

There is more that had perhaps better be left unsaid. In any case, we are not out to reform the cartoonists.

Fairfield Osborn

IN THIS ISSUE

Otter on the Alert . . . . COVER
Apotheosis of the Zoo . . . . *William Beebe* 50
Ten Ways of Helping Baby Birds . . . *Lee S. Crandall* 56
Alas, Poor Annie! . . . . *William Bridges* 58
Portraits of Four Primates. II. 59
Before Montefiore Joash Sunshine . . *Claude W. Leister* 63
Behind the Scenes: News and Notes 71

SHOP TALK

Much against our inclinations, we have to say a good word for rain—to be exact, the rain that has been falling on the Zoo since (it seems) time immemorial. It was the cause of us getting the very superior picture of an otter that decorates the cover of this issue of ANIMAL KINGDOM.

When we proposed to Sam Dunton, our staff photographer, that he try making a series of shots of Emil Liers' otters just for the sake of a photographic record, his brow clouded and it looked as if Sam, too, was going to rain. The usual playing places of the otters, around Baird Court, were not suitable for the kind of pictures Sam had in mind.

But then he brightened. "All this rain," he said, "has made a fine swamp back there in the woods. Suppose I took the otters down there and got them in a natural habitat, sort of?"

So we said, "By all means, the swamp."

It was a good idea in one way, and in another it wasn't. Two hours later Sam came dripping back.

"On the way to the swamp," he said, "I found a honey of a rock ledge and posed one of the otters there. It's just the kind of a picture you want."

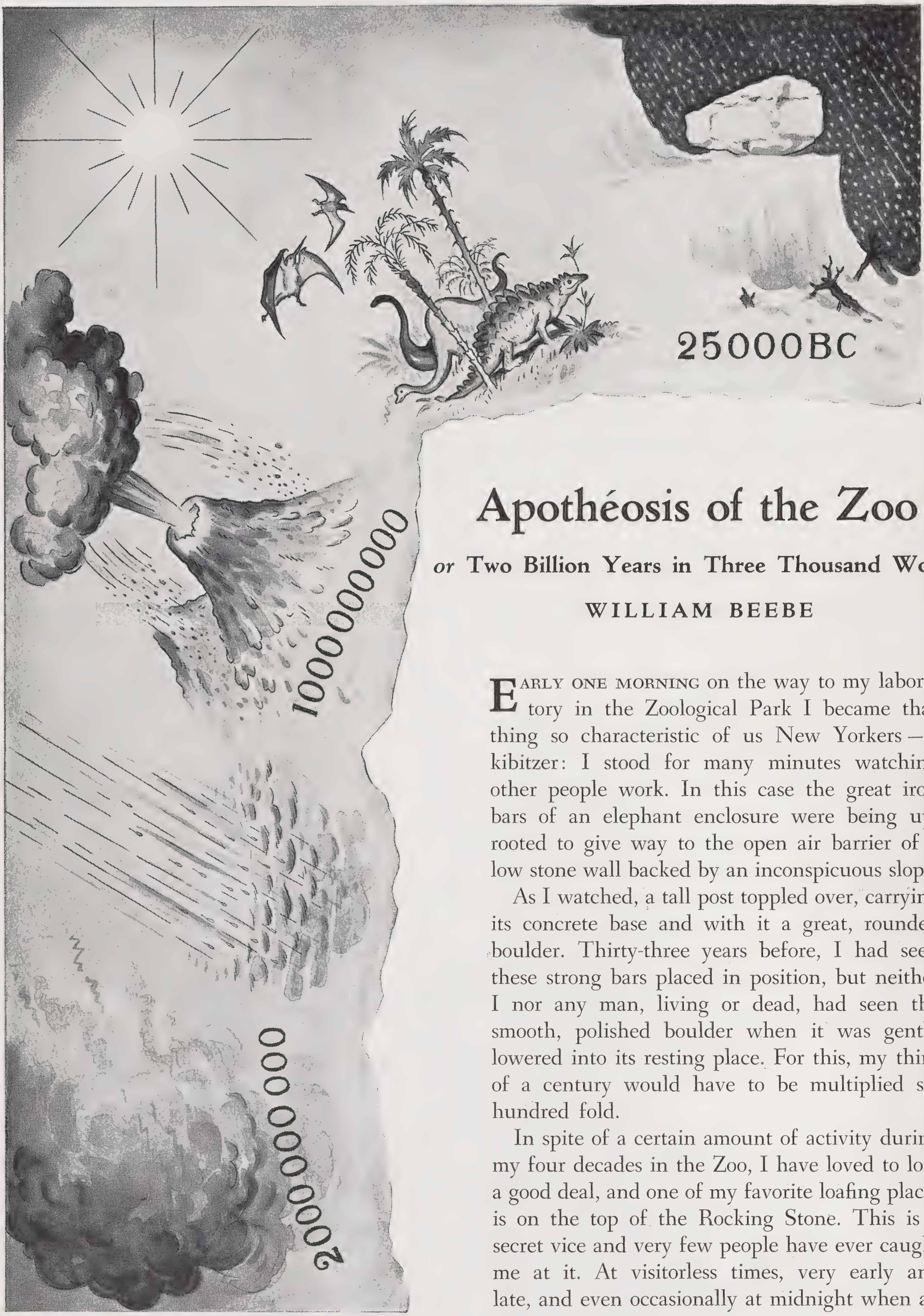
But what about the swamp?

"Oh, just as I thought, the rain made a fine swamp and the otters loved it," Sam explained. "I didn't get any pictures at the swamp, though. I fell in."

* * *

Anybody got a haywagon he wants to lend the Zoo for the summer? We've been running a "haywagon taxi" between the Zoo and the Farm-in-the-Zoo this summer on week-ends only, and people stand in line—hundreds of them—for a chance to get aboard. Another haywagon would be just dandy, but the species seems to be pretty near extinct around New York.—EDITOR.

JUN 14 '43



Apothéosis of the Zoo

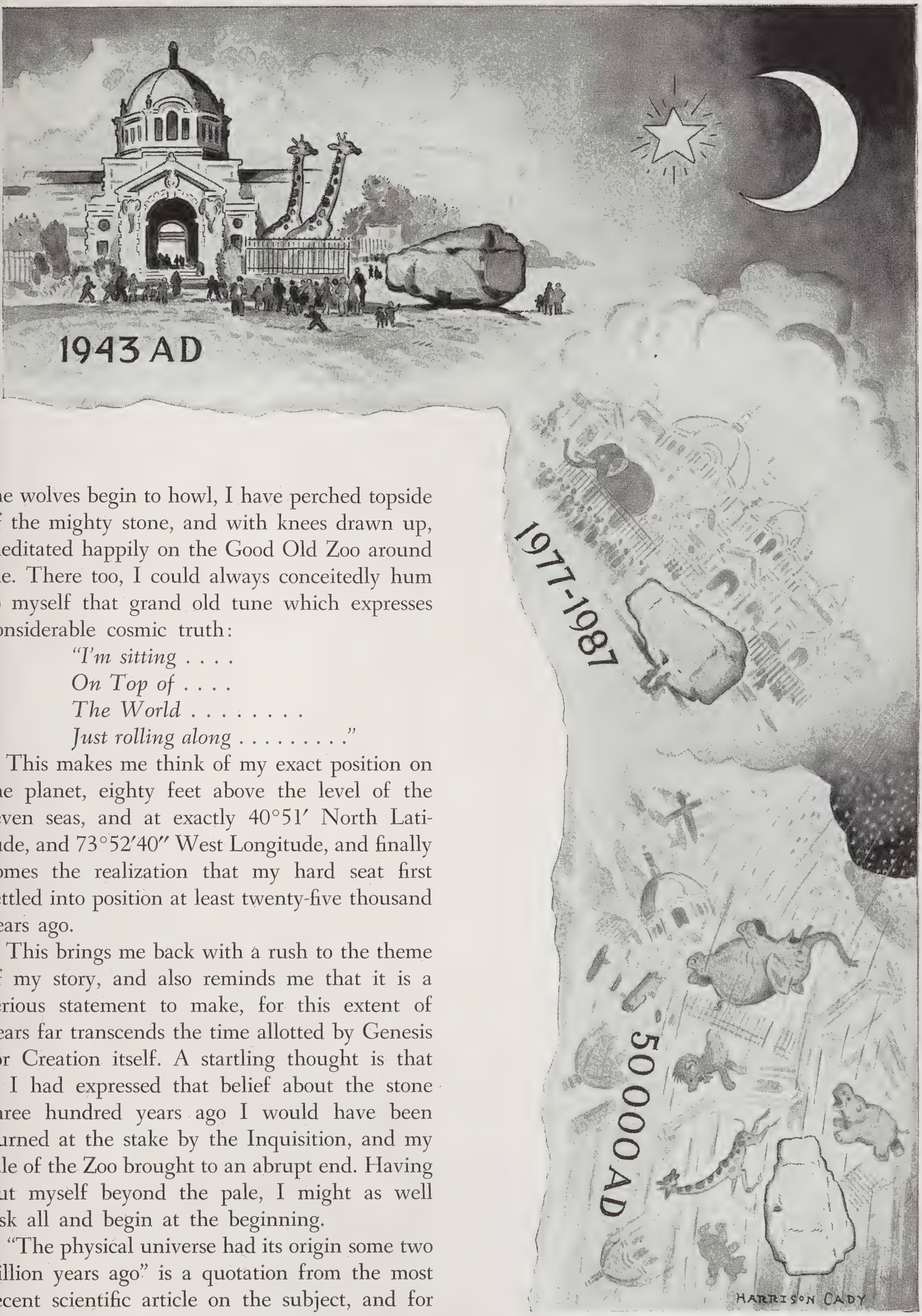
or Two Billion Years in Three Thousand Words

WILLIAM BEEBE

EARLY ONE MORNING on the way to my laboratory in the Zoological Park I became that thing so characteristic of us New Yorkers – a kibitzer: I stood for many minutes watching other people work. In this case the great iron bars of an elephant enclosure were being uprooted to give way to the open air barrier of a low stone wall backed by an inconspicuous slope.

As I watched, a tall post toppled over, carrying its concrete base and with it a great, rounded boulder. Thirty-three years before, I had seen these strong bars placed in position, but neither I nor any man, living or dead, had seen the smooth, polished boulder when it was gently lowered into its resting place. For this, my third of a century would have to be multiplied six hundred fold.

In spite of a certain amount of activity during my four decades in the Zoo, I have loved to loaf a good deal, and one of my favorite loafing places is on the top of the Rocking Stone. This is a secret vice and very few people have ever caught me at it. At visitorless times, very early and late, and even occasionally at midnight when all



the wolves begin to howl, I have perched topside of the mighty stone, and with knees drawn up, meditated happily on the Good Old Zoo around me. There too, I could always conceitedly hum to myself that grand old tune which expresses considerable cosmic truth:

"I'm sitting . . . .
On Top of . . . .
The World . . . .
Just rolling along . . . ."

This makes me think of my exact position on the planet, eighty feet above the level of the seven seas, and at exactly 40°51′ North Latitude, and 73°52′40″ West Longitude, and finally comes the realization that my hard seat first settled into position at least twenty-five thousand years ago.

This brings me back with a rush to the theme of my story, and also reminds me that it is a serious statement to make, for this extent of years far transcends the time allotted by Genesis for Creation itself. A startling thought is that if I had expressed that belief about the stone three hundred years ago I would have been burned at the stake by the Inquisition, and my tale of the Zoo brought to an abrupt end. Having put myself beyond the pale, I might as well risk all and begin at the beginning.

"The physical universe had its origin some two billion years ago" is a quotation from the most recent scientific article on the subject, and for a completion of the sentence we may go back two thousand years in human history and quote an unknown author in the second verse of Genesis, "— and the earth was without form, and void." We have a silly, trite phrase that *Time is Money,* so when I ask you to consider what the Zoo looked like two billions of years ago, the American mind of 1943 is not wholly staggered, for every newspaper tells us of the spending of many times more dollars.

Any attempted definition of universe formation is outside of my humble thesis and beyond my ability. What would you expect of me in view of the fact that curved space permits the possibility of four hundred million nebulae, all whirling madly in a universe of finite volume but without boundaries! I even ignore the astronomer's naive classification of "Our Local Group" of a dozen isolated nebulae, and am satisfied with considering an infinitesimal portion of the minute speck of dust in our lonely stellar system — a speck, our earth, which at present we are so earnestly endeavoring to depopulate.

I have casually offered for your consideration a formless pre-world, yet we must admit that somewhere in space, even then, were the basic materials for a Zoo. Astronomy presents a vision of whirling, white-hot gas, composed of isolated elements. Cooling and concentration brought these lonely inorganisms into closer relation; gas thickened, began to boil, then to flow and hardened into rocks; hydrogen and oxygen flew together and made steam and water; carbon, oxygen and nitrogen became air. This is all so glib and so unreal as we wander about the Zoo today that I feel I must do something about that two billion. There is no denying that it is a heck of a time to separate us from all the days of the soft-boiled earth. So let us exchange past time for the present and think up a bit of modern magic.

We stand in the center of the Zoo on a gray, rocky outcrop, and box a forty-mile compass circle: Garrison, Bridgeport, Setauket, Asbury Park. Not very exciting and of interest chiefly to commuters whose trains may or may not arrive within the two-hour schedule. But there are other directions, so look up, and if the day is clear you can see much farther than forty miles. But there is no commuting and only the brave little meteorological balloons can bring us word from naked space: thinnest of thin air and the bitter cold of the "Wind that blows between the Worlds," ninety degrees or more below freezing. Finally we look down, and see nothing but our feet standing on the hard, rocky backbone of the Zoo. But geologists and physicists can provide mental vision and they assure us that forty miles down will bridge the two billion years; an inverted Asbury Park distance will bring us to a temperature of molten rock, twenty-five hundred degrees of heat, at which steel itself runs like water.

Still more magic is ours, for the very outcrops on which we stand are igneous, fire-formed gneiss, and when we realize that some of the rocks of our northeastern United States are the oldest on the whole planet, we know that we have conquered both time and space within our Zoo today.

We have now seen our aforesaid Zoo materialized, brought to a gentle simmer, and set aside to cool by the First Great Cosmic Cook, Chemist and Creator. For this we must allot the whole of the first billion years. Then begins Act II in the Drama of Creation. Just as the elements arranged themselves into air and water and earth, so somewhere, sometime, somehow, a new sublimated synthesis came to pass, and what we call Life was born.

We are now started on our second billion years, but our Zoo thesis does not require any detailed accounting eon by eon. Beginning with humble animal-plant blobs, we pass on through amoebas, sponges, corals, worms, starfish, clams, lobsters and spiders, bees and butterflies, fish, frogs, lizards, birds and mammals. Here again we do not need to go back through the billion years or to depend on fossils or even living creatures from far distant seas and lands. Within the confines of our Zoo's two hundred and sixty-one acres, there are today eleven out of the thirteen major groups of creatures living on the planet.[1] This is really a very remarkable thing, a Zoo within a Zoo, hundreds of species of wild animals, requiring no cages or special food or keepers. All eleven groups are on exhibition to any of us with sufficient curiosity.

---

[1] The only two missing groups are the marine phyla typified by comb-bearing jellies and by starfish.

Let us consider only three primitive lives — all to be found in our lakes or our river: a lowly Flagellate, a veritable mote of life, that whips itself about in the bottom slime, and may be so archaic, so dateless, that it simulates a plant in the daytime and an animal at night. Or the Amoeba, an immortal single cell, whose forebears appeared in the very womb of the world, and whose simple self typifies the stuff for the formation of all higher animals, including those of us who love to flatter ourselves that we "made" the Zoo. Lastly, marvel please, with me, at the lovely Volvox which rolls with dignity across our microscope stage, a dignity well deserved, for in its being it mirrors the early, many-celled organisms which were to culminate in sequoias and elephants. Volvox is also exciting, even at this late, sophisticated date, as adumbrating the beginning of sex.

Long after all birth pains of the Zoo were past, our pleasant plot continued to have an exciting time. More than once it was completely submerged, with the Atlantic breakers roaring high above its water-soaked granite. Another time it slowly reared itself up until it was far inland, while the neighboring Hudson River cut a magnificent gorge for itself a hundred miles out at sea. Bitter cold alternated with such blazing tropical heat that palms and cycads flourished on the shores of Greenland far to the north.

To lessen the strain on the time lobe of our human brain, let us forget billions and come down to a mere two hundred million years ago in the Zoo. Four miles away, at Fort Lee, Manhattan's Oldest Inhabitant lived at this time, a twelve-foot, weird, crocodile-like reptile with rows of terrible teeth. His bones were recently dug out of the Palisades, rather low down, for as yet no New Jersey volcano had built them up with outpourings of lava.

From now on a Zoo collector would have gone mad with joy anywhere in the United States or elsewhere, and what exhibits could be shown! Imagine the Flying Cage filled with dragonflies whose filmy wings stretched almost a yard across, or a flock of long-tailed, downy Archaeopteryx gliding from tree to wire, while diminutive dinosaurs, smaller than chickens, scampered gracefully about on their hind legs.

If a crate came to the Zoo containing a Pteranodon we would be at a loss where to put it — that naked, dragon-like flying reptile with a wing spread of twenty-four feet. And while we are at it, let us revel in a welter of imagination at finding a leathery-shelled egg as big as a football in that same crate! How easy to visualize the sea-lion rocks removed and a Brontosaurus swashing slowly about with head and neck reared twenty feet above the heads of the visitors.

In those early days the reptile department of the Zoo would dominate all others. There would be no bird house. Only a few small cages to accommodate loon- or tern-like feathered primitives with powerful teeth in their beaks. The aquarium would be large and varied, and a few giant amphibians would crawl about their enclosures. Our Botanical Garden neighbor would have a splendid showing of giant mosses and ferns, conifers and cycads, but not a single flowering plant.

Finally, the mammal department would be the least interesting of any in the Zoo, exhibiting a few, small, furry animals, looking like arboreal shrews. In the wild each was a veritable "Wee sleekit, cow'rin', tim'rous Beastie," creeping about at night on its search for insect food, in complete terror of its life from any reptile larger than an iguana. Far from being Lords of Creation, Makers of Zoos, we human beings, in this Mesozoic Era, were not even thought of. We would come along in due time thousands upon thousands of years hence, as the lineal descendants of these shrew-like, weakling, cockroach-eaters.

Having taken a long, humble breath after this last thought, we plunge again into the past. The present is hurrying toward us; less than a million years are left before we ourselves walk upon the stage, but rocks and mountains, fossils and crystals all provide a decipherable palimpsest. Four times, continents of ice push south, two of which drive across and overwhelm the Zoo. The last time, when the old stagnant ice finally softens and melts, it lowers into place stones, gravel and soil, and with these the smooth boulder in the elephant yard, and even our Rocking Stone, lowering it gently, delicately. It comes to rest exquisitely balanced, so that anyone can push against and sway its fifty tons, to and fro. Three times the ice sheets retreat, with long seasons of great warmth following in their trail. We are now living at the beginning of the Fourth ’tween Ice Age Summer.

A veritable cavalcade of wonderful animals now lived in and around the Zoo, passing over the very rocks on which we stand, or within galloping, hopping or flying distance. This we know: walruses frolicked off Long Branch; giant beavers and bisons, huge ground sloths, hairy tapirs, out-sized peccaries and at least two species of sabre-tooth, stabbing tigers all lived at our gates, or within one hundred miles. Forest horses galloped as near as Throg’s Neck, all-American steeds, unlike the immigrants of Cortez and today. Imperial mammoths, more than thirteen feet high, with tusks four yards in length, may have swung in herds past the Rocking Stone, but were seen by no living man here, although ancient cavemen of France fought them, and refrigerating Siberian glaciers spewed them forth, perfect in flesh and hair. The last mastodon which walked through our Zoo slipped into a peat bog three miles away, at Broadway and 141st Street, and died there.

When the last ice began to melt there came men of old, wading or canoeing across from Asia to Alaska, and then spreading over all the land, until we have the first record of them as Red Indians. Warriors and hunters from the Hackensacks, Tappans, Rockaways, Montauks, Navesinks and especially Mohicans and Manhattans hunted and fought in or near the Zoo, and probably spied out the land from atop the Rocking Stone.

Up to now, Time, to the Zoo, had been an illusion; merely successions of cold and heat, darkness and light, without name or classification. Then one day a symbolic number fixed by human mind arrived, significant, but almost laughable in its pettiness, a momentary full-stop lost in time and space – namely the third of September, 1609. Or if we wish to make the most of man-counting time, let us say that when this paper and print meet your eyes, a few more than one hundred and twenty thousand sunsets will have come and gone since a lonely Englishman leaned on the rail of his little shallop off Staten Island, and gazed toward the low, forested shore on which he was to land. Ten days later Henry Hudson sailed past within three miles of the Zoo.

Time, as we know it, now passed swiftly. There were fights between Indians, Dutch and Englishmen on or close to the Zoo. One of my very special treasures is an almost perfect Indian arrowhead which I picked up one spring, washed out of the side of the bank of the Bronx River near the falls in the Zoo. It is made of flint of a pale yellow color, unlike any type of stone in the vicinity of New York City.

On the twenty-third of October, 1776, a small band of patriots under Colonel Hand defeated a larger number of Hessians at Williams Bridge. Today, one hundred and sixty-seven years afterward, in several places in the Zoo, I see the sign *Air Raid Shelter,* a hint of the most recent conflict between the descendants of those same patriots and those same Germans.

Forty-four years ago, much of the Zoo was a wild tangle of undergrowth and forest, the buildings still in the stake-and-string stage of a boom town. The evolution from then until today has been smooth and unbroken under the leadership of Green, Morton, Osborn, Grant, Cross and Osborn *bis.*

But we may not draw breath, we cannot stop a moment in the present. As I write these words, they already become past. Next year will be 1944; six years more, 1950. On and on time goes. We can imagine unbelievable changes in our beloved little plot of ground. We have seen it in thought pass from cold cosmic space, on to gas and steam and boiling water; through fiery molten chemicals cooling to solid igneous rocks. The waters rise and engulf it, then sink; soil and air stabilize; life appears and evolves with no human eye to see. A superlative array of reptiles and mammals passes in review, with no cage to confine, no man to wonder. If we keep to the cosmic schedule, the inception and development of our present Zoo occupy only a fleeting second of geological time, conservatively, one forty millionth.

What of the future? As I write, let us suppose hundreds of thousands of years have already passed. It is in the dim, distant future, and my faltering human mind can be certain of only one ultimate happening.

Let us visualize it: I came into the Zoo a few weeks ago in a driving snowstorm. The

Rocking Stone was capped with white, and, all around, the ground was a foot deep in millions of snow crystals. My imagination can conceive the next day and the next and the next as of continued storm; frantic radio messages come from Canada of a slow-moving continent of ice, coming nearer and nearer, of never-ending snow. From along all ocean shores come reports of the slow sinking of the sea itself, leaving the beaches bare and frozen.

Ice Age Number Five is on its way!

All animals and human beings flee southward or perish. No man-made explosives or heating plants can do anything to stop the cataclysm for a moment. Soon come the last living creatures, polar bears whimpering with fear, snowy owls, muskoxen searching for a final bit of moss, walrus swimming down the coast. At last the enormous pale green ice front of cliff, perhaps a half or a full mile in height, crunches and grinds its way to the Zoo, just as it has done twice before. The houses, everything, crumble like clusters of twigs and pebbles. Last of all, if there could be any human eye to see, the age-old Rocking Stone itself is stirred, pushed from its bed, and like a great snowball rolls slowly southward in the fore-front of the glacier.

Time Marches On!

[Probably it is not necessary, but just the same I call our readers' special attention to the two drawings at the beginning of this fantasy, Harrison Cady made them; one of America's foremost illustrators took an hour off to contribute to the gaiety of Zoology.]

". . . the Rocking Stone was capped with white, and, all around, the ground was a foot deep in millions of snow crystals . . ."

Ten Ways of Helping Baby Birds

This Is the Time of Year When Boys with Shoeboxes Are Likely to Be Bearing Gifts to the Zoo

LEE S. CRANDALL

If two boys and a shoebox come into the Zoological Park on a spring day, the chances are that the shoebox contains:

(1) A baby bird (or birds),
(2) A garter snake, or
(3) A turtle.

In the opinion of the Bird House staff, the box *always* contains baby birds, for dozens of fledglings are presented for care and feeding, or attention to injuries, every spring. The donations seldom are as complete, however, as one that came during the first week in May. Two boys from Yonkers arrived with a lard can containing a whole robin's nest and three baby robins not more than two days old. They explained that a neighbor had cut down a tree, not knowing there was a nest in it, and they had rescued the nest and its occupants. The Bird House staff accepted the gift—unenthusiastically, for feeding three voracious baby robins for a couple of weeks until they can feed themselves is a good-sized job. Nevertheless, there was nothing to do but to accept the responsibility. Otherwise the birds would have starved to death, for their parents would be unlikely to continue feeding them if the nest were taken back to the neighborhood of the original nest-tree.

The problem of what to do with baby birds that get into difficulties is one that perplexes hundreds of persons each spring, to judge from the telephone calls to the Bird Department. For their benefit we have compiled a list of hints on care and feeding.

But we ought to emphasize, however, that only emergency treatment should be given young birds because under New York state conservation laws it is illegal to harbor wild birds, with very few exceptions. The law states that they "shall not be taken or possessed at any time, dead or alive," except under special permit. At the State Conservation Department's information office at 80 Centre Street, New York City, it was said that it is all right for anyone finding a fledgling bird on the ground to put it back in a tree or nest, but that the Conservation Department should be informed if the bird were actually kept for feeding and treatment. The proper procedure would be for the person caring for the bird in New York State to write the circumstances to William G. Jacquemin, State Conservation Department, 80 Centre Street, New York City, whereupon the circumstances would be investigated by the department. The humanitarian would thereby be protected in case he was reported by someone as illegally keeping a wild bird.

Our ten best suggestions for temporary and emergency measures to keep very young birds from starving to death or being killed by cats and dogs are:

1. If a nest containing young birds is blown out of a tree, try to put it back in its original site. If the birds are very young, the mother will probably continue to feed them; if they are almost old enough to fly, they will probably refuse to stay in the nest. This is natural and nothing need be done about it.

2. If the nest is destroyed or helpless birds are found on the ground, they can be put in a substitute nest. This should be lined with something soft – cloth, cotton or dried grass roughly shaped into the form of a nest. The purpose of this is to give the young birds' feet something to push against; if placed on a hard,

Suburbanites are always worrying about "ferocious bluejays" swooping down to attack pedestrians who pass under their nests. Curator Crandall's advice is: Stay away from the nest or pay no attention to the fluttering birds.

flat surface their legs will spraddle and because of their rapid growth at this period will be likely to "set" in a spraddled position.

3. Young birds placed in a temporary nest should be covered with a cloth and kept warm, as they are used to being hovered by the mother and kept warm.

4. Baby birds must be fed at intervals of at least half an hour during the daytime. If they are very young they will open their mouths to be fed when their nest is jostled. Slightly older birds, getting on toward the flying stage, will be too frightened to open their mouths and their beaks will have to be opened by the fingers.

5. The proper method of feeding a very small bird is to push a bit of food into its open mouth by means of a smooth spatula or a pair of blunt forceps, or even by two small sticks held in "chopstick" fashion.

6. Small birds should never be given water from a medicine dropper. When they are old enough to sit on a perch, water can be offered them in a shallow dish. Small birds are quickly killed by water given them forcibly.

7. Proper food for baby robins, bluejays, orioles, catbirds and sparrows is:

Canned dog food.

Pellets made of bread crumbs and hard-boiled egg, moistened with cod-liver oil.

Bits of grapes, cherries, bananas or meally apples.

Pieces of earthworms that have been "squeezed out."

Small pieces of scalded chopped meat.

8. Young birds that are able to fly only weakly and are in danger from cats and dogs while on the ground, may be placed in a tree out of harm's way. The parents will find them.

9. Birds assisted by their human friends should be turned loose at the very earliest moment, not

only because it is illegal to continue to keep them but because they will become unable to find food for themselves if they are accustomed to being fed by hand. Normally the parent birds teach the young to find food, and human assistance is no substitute for the bird's own efforts.

10. Suburbanites should not be afraid of baby birds and their parents. Each spring usually brings reports from nearby towns that "ferocious bluejays" are attacking people. Our advice is to stay away from the vicinity of bluejay nests or, if that is not possible because a nest is near a public walk, to pay no attention to the darting and fluttering of the birds. They won't hurt anybody.

Alas, Poor Annie!

WILLIAM BRIDGES

It is a fine point whether a penguin that has laid a fertile egg is any part a parent. That she is not wholly fulfilled, both nature and the popular idea agree; nature decrees an additional devotion of thirty-eight days of incubation. The popular idea is, "Let's see the chick!"

Alas! Annie, our romantic black-footed penguin, having fulfilled and more than fulfilled the requirements of nature, can still not satisfy public clamor. Annie will have no chick in 1943. Her first egg was a shaker.

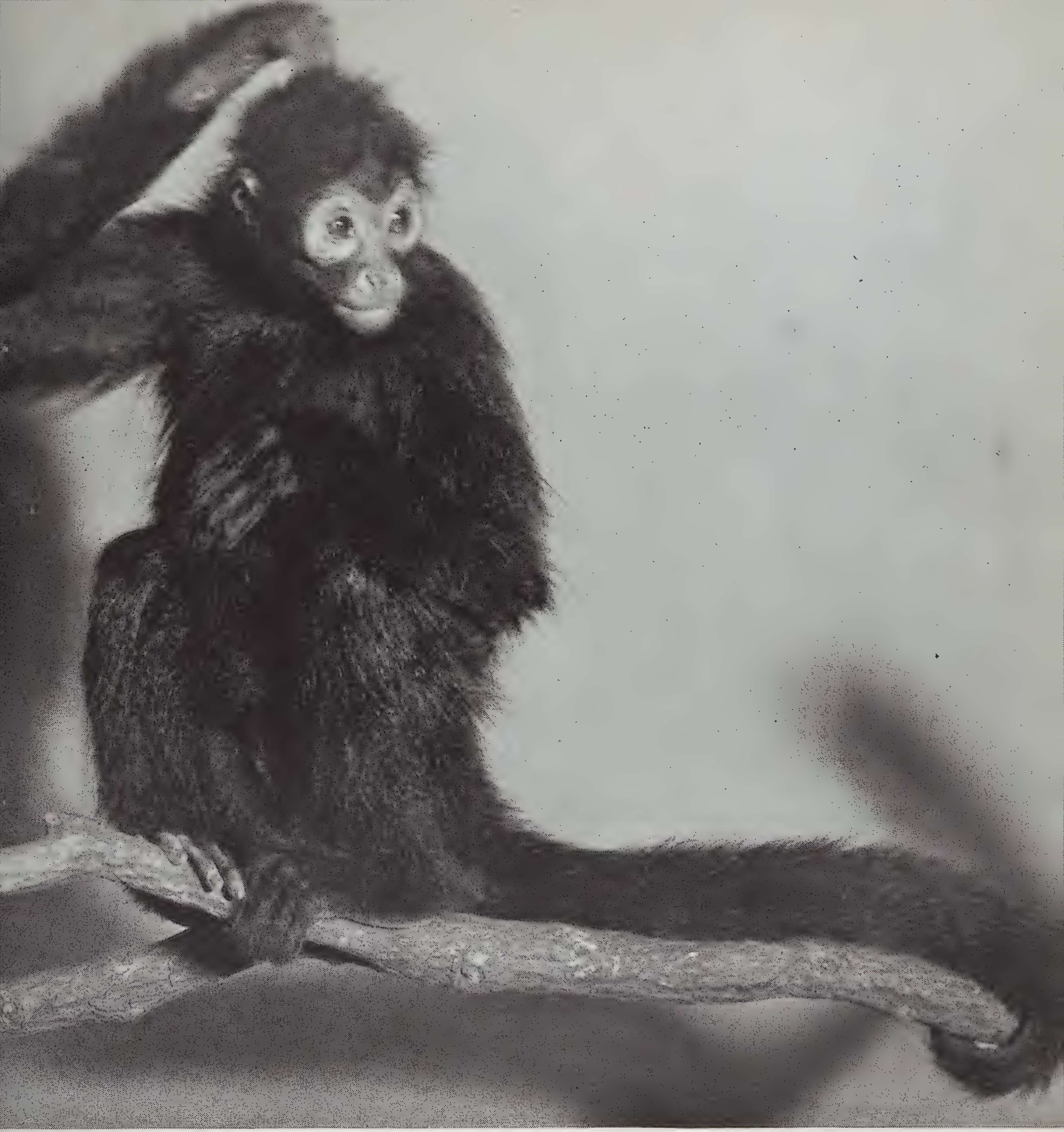
As penquin lives go, hers has been a full one. At the very beginning of her career in the old Aquarium she assumed a leadership never successfully challenged. She was not found wanting when called upon to exemplify the athletic and the intellectual powers of her kind at the Zoological Society's building at the World's Fair. When other penguins hung fearfully back, appalled by thoughts of translation from dry duckboard to the aqueous element of the Penguin Pool, it was always Annie who made up their minds for them. When it came to diving, Annie's dive was always the best.

Until laterly she had no mate. Last winter a handsome Humboldt found favor in her eyes. But it was an ill-starred match; no sooner had she found a friend than a rival appeared. Her indignant mate felt obliged to kill him.

Annie's first egg was deposited on April 6 in a nest compounded of sticks, old fish heads, peanut shells and cellophane wrappers. She nested dutifully. Her egg was fertile. But somehow, some time, during those thirty-eight critical days it stopped developing.

Alas, poor Annie!

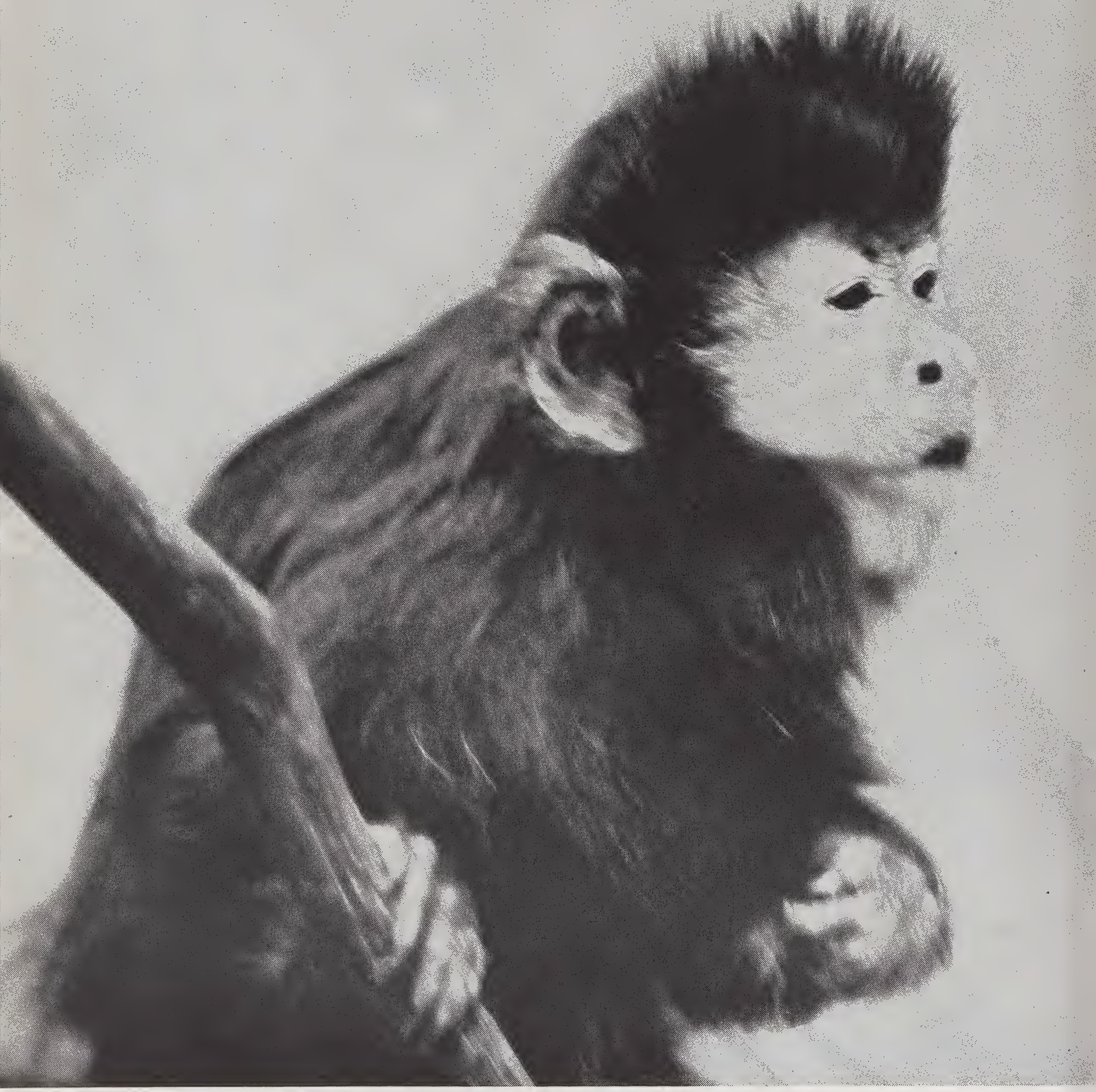
On the last day of her vigil, Annie devoted herself to her nest while other penguins gathered around as if to keep her company. Annie's Humboldt mate was restless; he is the bird in the upper right corner of the scene.



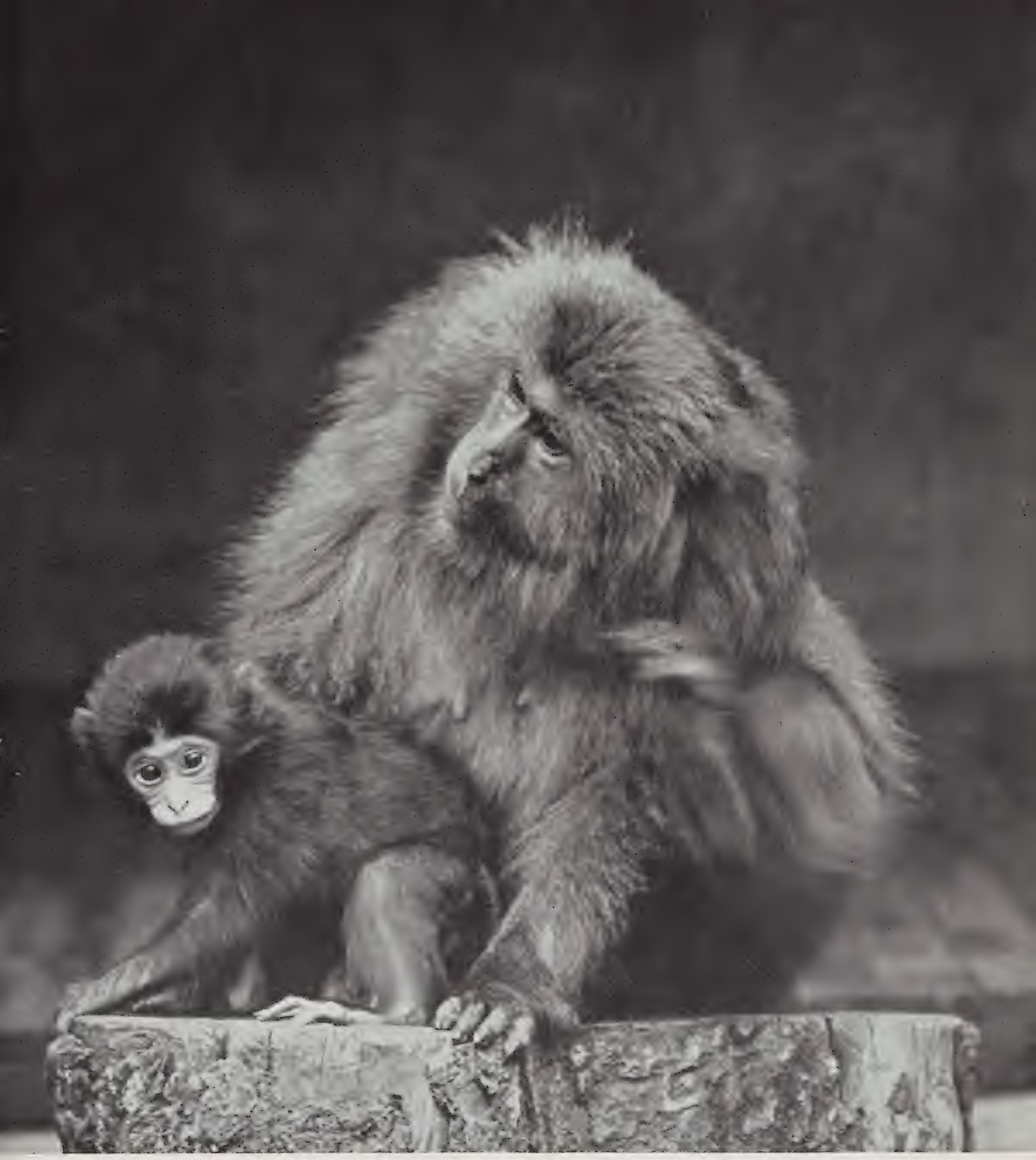
Portraits of Four Primates. II.

Spider Monkeys have a perpetual air of surprise, not only at the actions of the human beings who watch them but at each other and at themselves. Yet their surprise and puzzlement is seldom real; they are self-sufficient creatures and almost never at a loss for something to do next.

This portrait (one of the series of magnificent primate portraits in the Zoological Society's publication, "Monkey Faces"), is not quite such a perfect example of head-scratching bewilderment as it seems. Nothing ever seemed to worry this particular Spider Monkey. It was the photographer who had the worry of trying to get it to sit still long enough to have its picture taken.



WOOLLY SAPAJOU . . . haircut in the style of Mr. Pecksniff



JAPANESE RED-FACED MONKEY... a name with no international significance

YOUNG GORILLA . . . the beginning of a tantrum

Before Montefiore Joash Sunshine...

A Long Line of Ancestors Stretches Back from Domestic Cattle and Its Beginning Is Lost in the Mists of Antiquity

CLAUDE W. LEISTER

Montefiore Joash Sunshine is the name of a modern milk-producing machine. To a farmer, and to the visitors to the Farm-in-the-Zoo who cluster around her at evening milking time to watch fifteen quarts of milk rise foaming in the pail, she is a cow, a particularly fine specimen of the black-and-white Holstein-Friesian breed. But zoologically she is just a milk-producing monstrosity man has created out of the possibilities inherent in the ancient *Bos taurus* of Europe.

It is a long way back from Montefiore Joash Sunshine to the beginnings of her kind. Before Montefiore Joash Sunshine there were Osborndale Sir James Homestead, her sire, and Montefiore Miss DeKol Ona Fayne, her dam, and before *them,* there were four other pure-bred Holstein-Friesians, probably all endowed with equally fantastic registry names.

Their ancestors, too, were Holstein-Friesians and it might be possible to trace a direct line of descent back a hundred years or more. We know that the first cattle of that particular breed came to the United States in 1795 from Holland and Northern Germany, where the breed originated. But the record begins to fade out not long after it reaches Holland, just as it fades out for other domestic breeds of cattle when it has been pushed back a century or two to their countries of origin.

Just how little is definitely known about the beginnings of modern domestic livestock we at the Zoological Park began to appreciate last year when the Farm-in-the-Zoo was opened for the first time. The more scientifically-minded visitors, remembering the cow-like form of certain of the wild bovines in the Zoo itself, wanted to know whether our domestic cattle—Holsteins, Jerseys, Angus, Herefords—were related to the wild types.

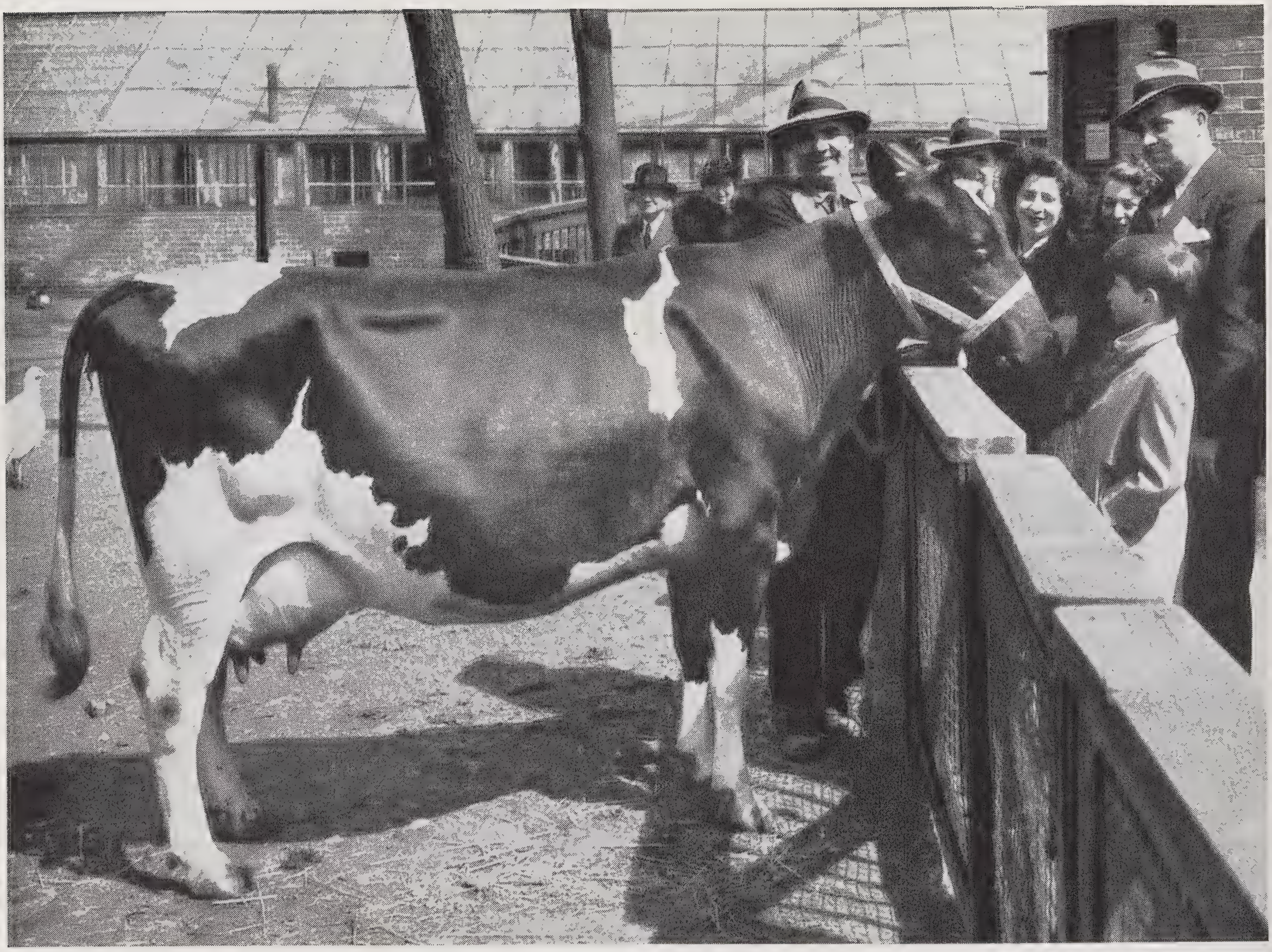
To answer that simple and natural question is usually difficult and sometimes impossible, as far as linking specific wild and domestic types is concerned. This article will attempt to tell some of the reasons why.

* * *

The New World has had an insignificant part in the evolution of wild cattle and the formation of domestic races. The family Bovidae, including cattle, sheep, goats and antelopes, is of Old World origin and did not come to North America until the Pleistocene, something like 800,000 years ago, when forms of the musk ox, bison, mountain sheep and mountain goat entered the continent by way of the Bering land bridge. While these animals gradually extended their range south and east over the continent, and the musk ox, the earliest of the immigrants, was forced by succeeding glacial periods into territory south of the Ohio and Potomac, not a single species reached South America, leaving that country entirely without representatives of the family.

The North American Indian and the Eskimo were primarily hunters and lacked the incentive to attempt the domestication of the wild animals at hand. Certain Indian tribes doubtless half-tamed occasional bison calves but we know from our own later efforts that the domestication of this animal is virtually impossible. The musk ox is utterless hopeless in this respect.

The first domestic cattle in America were brought by Columbus, in 1493, on his second voyage. Our Texas longhorns date back to Spanish parent stock brought from Santo Domingo



The milk producing machine known as Montefiore Joash Sunshine is a registered Holstein-Friesian cow, and a particularly fine specimen of her breed. She was lent to the Farm-in-the-Zoo by the Holstein-Friesian Association of America as an example of a type that is extremely popular on New York State farms. She gives about 33 quarts a day.

to Vera Cruz, Mexico, in 1521. Outside of its historical connection with our southwest, this breed is particularly interesting because so many of these early animals were allowed to go feral that natural selection and reversion played a large part in producing the animal we know as the old time Texas longhorn. Good examples are rare today.

Early American settlers brought their favorite breeds of cattle, largely of English origin, along with them to the New World. The condition thus established has been maintained to the present day and practically all of our foundation stock has come from the British Isles and western Europe. There are no truly American breeds and our role in cattle breeding has consisted largely in improving existing breeds. The better known of these improvements, which are usually referred to as American breeds, are the polled Hereford, the polled shorthorn and the French-Canadian.

To place domestic cattle zoologically, we find that, according to Lydekker, they belong to the Taurine group of the Bovidae, which also includes the humped cattle of India and Africa. Other groups are the Bibovine, including the gaur, gayal and banting; the Bisontine, including the bisons and the yak; and the Bubaline, the buffaloes.

In gross appearance members of each group are much alike, except in size and color. The wild gaur of India and the Malay peninsula is an enormous animal sometimes exceeding six feet in height at the shoulder. The anoa or pigmy buffalo of the Celebes is slightly over three feet in height, the smallest of the species represented in the above groups.

Our beef and dairy cattle have been derived chiefly from the European ox, *Bos taurus,* the Celtic shorthorn, *Bos longifrons,* of western Europe, and the zebu, *Bos indicus,* of India and Africa. In discussing the origin of modern breeds of cattle, this statement can be made with good authority. Further than that we can not go without wide investigation, for the problem is thoroughly entwined with the early history of man. The zebu is believed to have been domesticated as early as 4000 B.C. An extinct Indian ox, *Bos namadicus,* probably had a domesticated form in 8000 B.C. The wild ancestor of *Bos taurus,* the name given to European cattle, was *Bos primigenius,* the aurochs or ur, which existed until more recent, historic times. It is mentioned by Caesar and other Roman writers, and according to Herberstain (1550), a herd was preserved in the Polish forest of Jaktorowka, near Warsaw, where the last survivor is now known to have been killed in 1627. That date probably marks the extermination of the aurochs as a living species.

The aurochs was well distributed over all of Europe, from Great Britain to northern Asia and south to North Africa. It was a magnificent animal, the bulls being at least six feet high at the shoulders, with wide-sweeping horns, curving upward and slightly forward and inward near the tips. We are not certain as to its color, but apparently it was brownish-black in summer and grayish in the winter. In general appearance it was a high-shouldered ox, a great deal like the present-day gaur of India, a closely related species. The aurochs was a forest-dwelling animal

Courtesy Philadelphia Zoological Society

The zebu of India and Africa is believed to be one of the progenitors of our domestic cattle and in addition it has been domesticated, in its own right, for something like 6,000 years. This zebu family group at the Philadelphia Zoo illustrates their variation in color. The large hump is characteristic of the animal.

and must have been extremely common, for its fossil remains are numerous.

It has been said that the Chillingham cattle, the half-wild English park cattle of Northumberland, are direct descendants of the aurochs, or at least descendants of a breed derived from that species. Some investigators state, however, that they are the descendants of cattle brought in by the Romans. If that is true, the Chillinghams are much farther removed from the aurochs than has generally been supposed. In this connection the west highland cattle of Scotland were almost certainly untouched by this same admixture of foreign blood and today they doubtless differ only slightly from their ancient ancestors.

The zebu has been domesticated since prehistoric times and so many centuries have elapsed and so many breeds have been produced that today we can only guess as to its ancestry. The species apparently originated in Asia and has been spread by nomadic peoples to Europe, Africa and Madagascar. Because of its long domestication and wide geographic range there is great variation in the different breeds. Thus some have two humps and there may be either thirteen or fourteen ribs. The horns are usually rather small but reach enormous proportions in the Galla cattle of Africa.

Zebus, or Brahmans, as they are generally called in the United States, because of their general hardiness and disease-resistant qualities have been imported in considerable numbers during recent years to cross with our beef cattle. They are now used generally in South America for the same purpose.

While we can not definitely trace the ancestry of the zebu, some authorities believe that it was derived from the banting, a modern Malay species with several distinct races. At least two extinct species of wild oxen show an apparent relation to the banting and zebu, as evidenced by the shape of the skull and horn cores. This similarity may indicate descent from a common ancestor.

Another species domesticated in prehistoric times is the Celtic shorthorn, *Bos longifrons,* known to have inhabited most of western Europe. The Swiss lake dwellers had a breed of cattle believed to be this species. Other primitive peoples also kept this half wild ox and numerous remains have been found in bogs and kitchen middens from Great Britain to Italy. Its obvious association with early man, coupled with a lack of written record concerning that association, has focused considerable attention upon the animal. Earlier authorities believed it to be a domestic breed of the aurochs. But it possesses many characteristics of the humped cattle and recent investigators have pronounced it Asiatic in origin and closely related to that group. It is, therefore, allied to the banting and zebu. The Celtic shorthorn did not become extinct. In England it was still common in 200 A.D. at the time of the Roman occupation, and with but little change lives today in the Irish Kerry.

It will be seen that many bovine species, especially the aurochs, Celtic shorthorn and zebu, are inextricably involved in the ancestry of our present-day domestic cattle. Nomadic prehistoric Asiatic tribes were undoubtedly accompanied by humped cattle on their westward migrations. The blood of these eastern species became mixed with European breeds. Centuries later the extension of the Roman empire led to another great interchange and mixture of then-existing breeds. Thus, while it is relatively easy to establish the aurochs, Celtic shorthorn and zebu as the principal progenitors of our modern breeds of cattle, the hundreds of crosses involved and the numerous admixtures of different blood added over the years can never be determined. It is most interesting, however, to give consideration to our various species of present-day wild oxen and to try to determine what part they have played in the development of modern domestic breeds.

Despite the lack of definitely convincing evidence, we can be fairly certain as to the derivation of some of these breeds. The previously-mentioned Irish Kerry is most like the Celtic shorthorn, and the Jerseys and Guernseys, apparently, have likewise descended from that species. Holstein-Friesians and Normandys have descended from the aurochs, presumably by way of the European ox. Much is yet to be learned concerning the ancestry of the remaining three hundred-odd breeds of the world.

Members of the Bisontine group of the Bovidae have seldom, if ever, been used as domestic animals in America and representative forms can be found only on preserves and in zoos. The

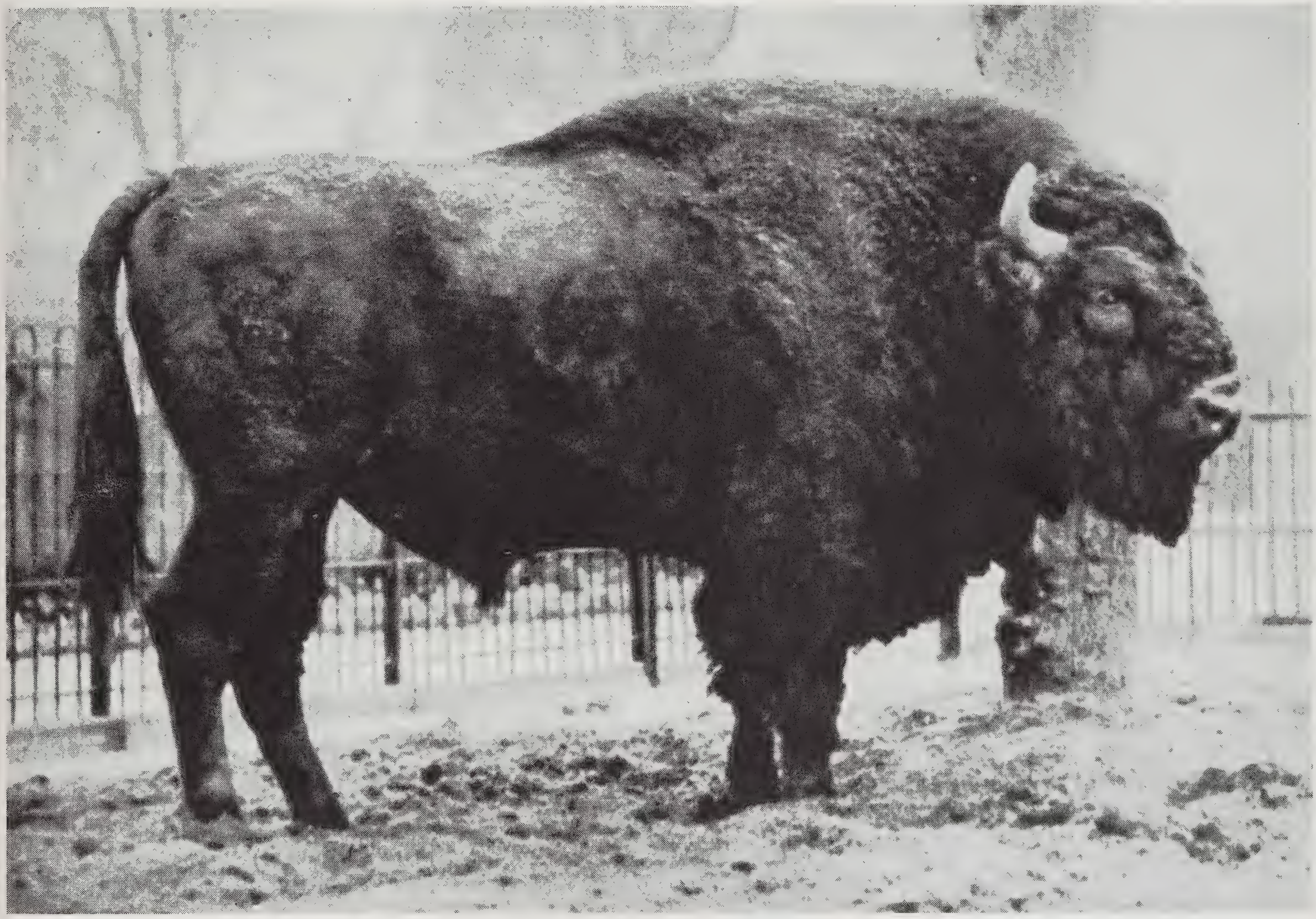
American bison was practically exterminated in the United States by 1900. Fears were held that it might become extinct, but timely action by the American Bison Society and the government so well preserved remaining animals that a steady increase was maintained for some years and today the supply is adequate for the areas suitable for the purpose.

The bison apparently lacks the temperament necessary for domestication but has a number of admirable qualities to recommend it for cross breeding with range cattle. While the flesh does not rival our beef breeds as to quality, the general hardiness of the species and its ability to ride out winter storms are generally lacking in domestic cattle. Bison-cattle hybrids have been called cattalos. To date all such cross-breeding experiments have met with indifferent success.

The European bison, *Bison bonasus,* is now on the extreme verge of extinction. During the First World War the scattered survivors of the species were greatly reduced in numbers. Only a few animals remained on preserves in England, Germany and the Polish national forest of Bialowitza, not far from the Jaktorowka forest, the last stronghold of the aurochs. The Polish herd was doubtless exterminated early in the present war, leaving only the animals in England and Germany.

The European bison is essentially a forest animal and in most respects is more like the wood bison of Canada than the typical species. Like the latter it has been unresponsive to all efforts toward its domestication. There seems to be little possibility of its having had any connection in producing European breeds of cattle.

The musk ox, *Ovibos moschatus,* is now confined to the Arctic regions of North America and Greenland. This animal shows a more or less puzzling relationship to the rest of the Bovidae. Some zoologists regard it as an arctic bison, others believe it to be allied to the rock antelope group.



Courtesy Natural History Society and Zoological Society of London

The magnificent European bison has been as unresponsive to efforts toward its domestication as has been the American bison, and there seems little likelihood that it contributed anything to the development of European breeds of cattle. This specimen of the European bison is in the Duke of Bedford's great collection at Woburn Abbey.

It has never been domesticated and is stubborn and unresponsive in captivity.

Unlike the bisons, the yak, *Poëphagus grunniens,* from the highlands of central Asia, has definitely been domesticated. This long-haired bovine is native to the high plateau and mountainous region of central Asia, where the domestic form is all-important as a beast of burden and a source of wool. The wild yak is found at an elevation of 12,000-15,000 feet and does not thrive when taken to low altitudes. It is believed that none of the really wild animals have ever been exported to other countries but that even the best of these have come from semi-domesticated races. The wild bull yak is a striking animal, almost six feet high at the shoulder, brownish-black in color, with imposing horns and a draping fringe of long hair on the lower shoulders, flanks and thighs, extending almost to the ground. Some of the domesticated races are practically indistinguishable from the wild species. Others are distinctly smaller and occasionally include piebald and white individuals. The first black yaks to be brought into the United States were imported by the New York Zoological Society in 1913.

The Bibovine group of the family Bovidae is found only in the Oriental region. It includes the gaur, gayal and banting. All are large, handsome oxen and, with the exception of the banting, have a prominent ridge on the back which adds to their impressive appearance. They are dark brown to almost black in color and all have white or whitish "stockings." Calves are reddish-brown. It is probable that all three species are in some way involved in the ancestry of present-day domestic breeds.

Although it has long been domesticated itself, the yak from the highlands of central Asia seems to have played no part in the creation of our modern breeds of cattle. They range in color from white through piebald to black. Back in 1913 the New York Zoological Society imported the first black yaks seen in the United States.

The gaur, *Bibos gaurus,* from India and the Malay Peninsula, is in many ways the most impressive wild ox in the world, and one of these almost coal black bulls, standing over six feet high at the shoulders, encountered in his native forest, must afford a never-to-be-forgotten spectacle. The gaur is generally shy and inoffensive, but solitary bulls are sometimes vicious and closely pressed animals are apt to turn upon their pursuers. Thus gaur hunting is regarded as a dangerous sport. This is especially true of the Malay gaur or slading, which is larger than the typical species and has the reputation of being more truculent.

There seems to be no real evidence that the gaur has ever been domesticated and it has been said that the calves can not be raised in captivity. However, the first of the species ever to be brought to America was imported by the St. Louis

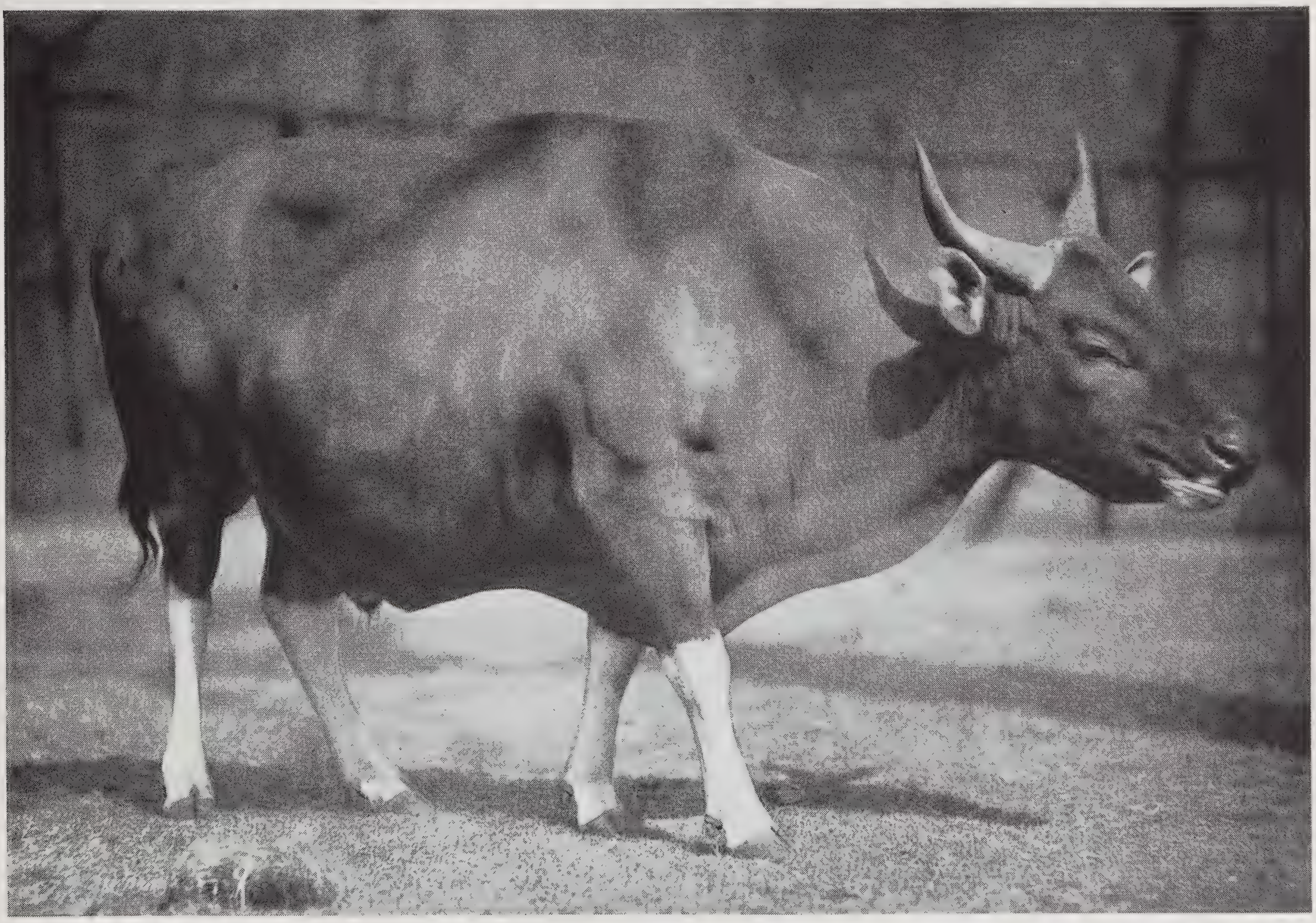
Zoo, where they have since bred on several occasions and the young are now well grown.

The gayal, *Bos frontalis,* from the hill districts of India, although it can be regarded as a species, is only half wild at the best, and at one time was believed to be a semi-domesticated race of the gaur. While much like the gaur in general appearance it is a smaller, more compactly-built animal with straighter horns. Our gayals at the Zoological Park have been placid and inoffensive. The mahogany-red calves have a short blackish stripe down the back and white stockings.

The third member of the Indo-Malay wild cattle triumvirate is the banting, *Bibos sondaicus.* It is well distributed over the eastern part of the Indian peninsula, the Malay countries, Java and Borneo. It is smaller and more slender than either gaur or gayal. There is more variation in color among its several races than we find between the latter species. Thus the bulls are black, except in the case of the Burmese banting where they are rufous fawn. Cows, instead of being brownish-black, are rufous. Calves are the customary reddish-brown with a dark back stripe.

The most recently-discovered species of the world's larger mammals is the kouprey, *Bos (Bibos) sauveli,* which was practically unknown scientifically until 1937, when it was first described. An account of this animal appears in the March-April 1943 number of ANIMAL KINGDOM. The kouprey is apparently closely related to the gaur and the banting. Almost nothing is known of its life history.

A plainly-evident close relation exists between gaur, gayal, and banting and all three species are said to interbreed where their ranges overlap. Largely for this reason many zoologists have regarded gayal and banting as forms of the gaur rather than distinct species. The group is apparently an ancient one and through the banting, especially, shows a relation to the zebu and, it is believed, the Celtic shorthorn. The gaur has been pointed out as being closely related to the



As a member of the Bibovine group, the gayal has perhaps had something to do with domestic breeds. It is, itself, only half wild and another member of the group, the banting, is supposed to be related to the zebu and to the Celtic shorthorn. The gayals we have exhibited at the Zoological Park have been placid and inoffensive.

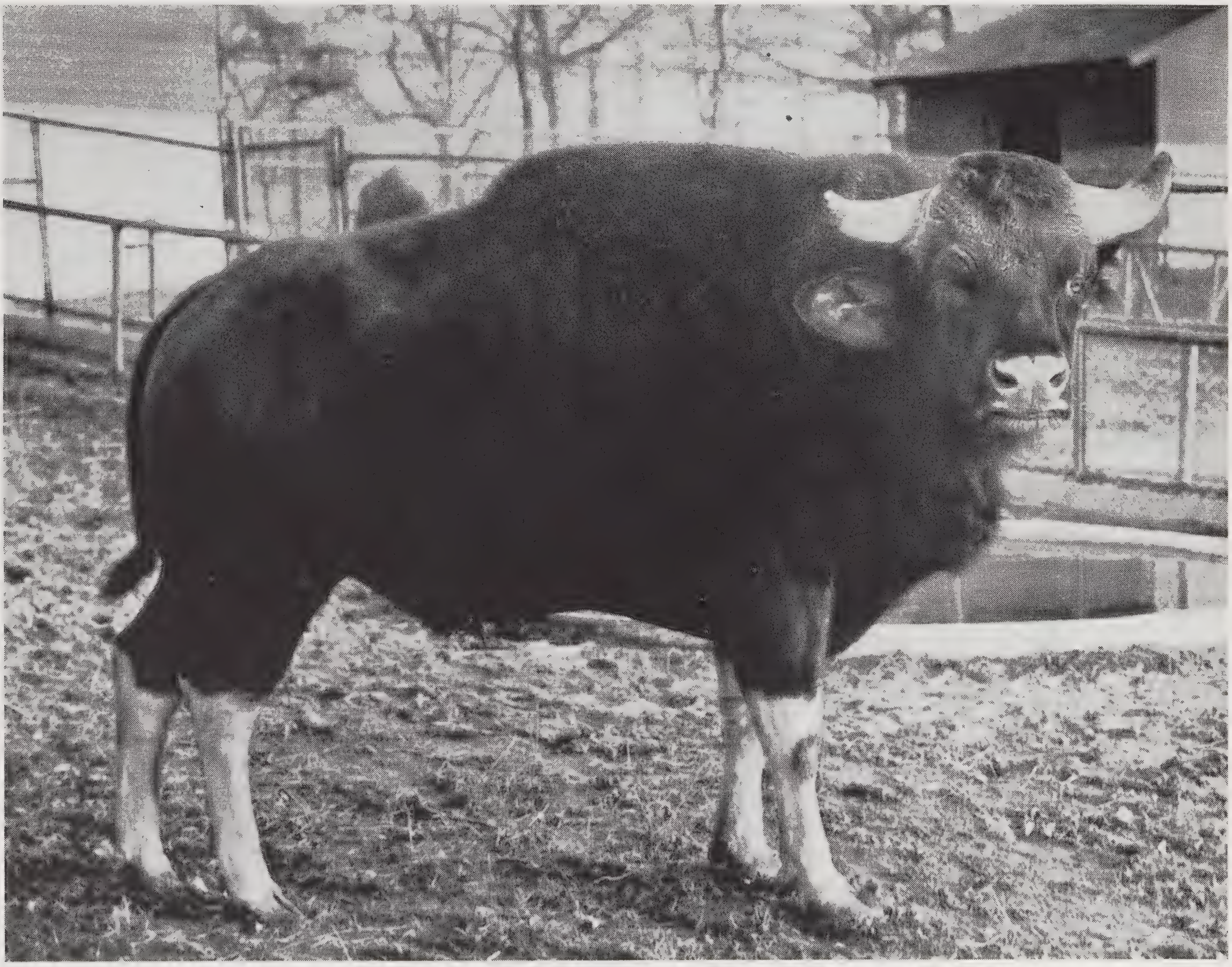
extinct aurochs. Thus it is possible that here in the Bibovine group we have the principal progenitors of all our modern breeds of cattle.

The Bubaline group of the Bovidae includes the buffaloes. The name buffalo is a misnomer as far as the American bison is concerned for the true buffaloes never reached North America and they are entirely Old World in distribution. As Lydekker points out, the African buffaloes are the most aberrent of the wild cattle, forming a distinct group and differing considerably from oriental species. They have never been domesticated. The best-known species is the Cape buffalo, *Syncerus caffer* from South and East Africa. Sportsmen generally agree that it is the world's most dangerous hoofed animal.

The Indian buffalo or water buffalo, *Bubalus bubalis,* is well distributed over the Oriental region. It has been domesticated since prehistoric times and is all-important to some of the Eastern peoples, since it furnishes not only meat and milk but serves as a draft animal and a beast of burden as well. In addition to the wild species, which is largely confined to India, a number of well-defined breeds are to be found from Egypt to the Philippines. It is now impossible to trace their origin.

The anoa or pygmy buffalo, *Anoa depressicornis,* from the Celebes, is the smallest of the Bovidae and therein lies its chief claim to fame. It has never been domesticated. Our anoas at the New York Zoological Park are pugnacious and untrustworthy.

The Bubalines do not breed with other bovids and therefore have no actual connection with the ancestry of domestic cattle.



Courtesy Philadelphia Zoological Society

The gaur, from India and the Malay Peninsula, is "in many ways the most impressive wild ox in the world," for the almost coal-black bulls stand more than six feet at the shoulder. As a relative of the extinct aurochs, it is possibly one of the principal progenitors of present-day breeds of domestic cattle. It belongs to the Bibovine group.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

BATHYSPHERE GOES TO WAR

Bathysphere, deep-sea Associate Diver of the Department of Tropical Research, after six busy years and thirty-three plunges far beneath the ocean off Bermuda, spent several seasons in exhibition; first in Chicago, next at the American Museum, and finally at the World's Fair. After this he went into seclusion at the Zoo, awaiting his next activity. Now he has been drafted and has marched proudly off to Washington and reported as a real Gob, V.A.S. (very able Seaman) in the United States Navy. Like most important draftees his mission is a very secret one, and all that his superior officer whispered to me was that "Bathysphere is to carry on secret underwater work relating directly to the prosecution of the war."

After the war, if he does not return to our Department at the Zoo with the stars and stripes of a full Admiral, he will at least have been instrumental in making things unpleasant undersea for the Germans and the Japs.—*Wm. Beebe.*

FARM DICTIONARY

Newest of our "publications" is a miniature Farm Dictionary, a sixteen-page booklet measuring 2¼ x 3 inches and defining some 75 terms commonly used on a farm. The need for such a dictionary (which not only defines terms but gives the correct pronunciation of some of them) was determined soon after the opening of the Farm-in-the-Zoo this spring. Visitors were heard to refer to a handsome Delaine Merino sheep as a "goat," and to talk learnedly of an "eewee"—meaning, of course, a ewe. The Farm Dictionary sells for 2 cents a copy over the counter. Or, rather, over the farm fence.

If any of our members order copies by mail, it is well to remember that postage is extra. A recent editorial about the Dictionary in the New York *Times* brought a flood of orders, each enclosing a 2-cent stamp. Postage (which we paid) was 3 cents!

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Life

Mrs. James C. Greenway
Lauder Greenway
George E. Ruppert

Annual

Louie A. Beard
Mrs. Louis Alexander Biddle
Henry A. Blum
Beverly Cory Chew
Mrs. W. Murray Crane
Frank L. Crocker
William F. Cutler
Mme. Elise de Souza Dantas
Colette d'Arville
Pierre David-Weill
William K. Dick
Mrs. H. Proctor Donnell
Sydney C. Erlanger
Edmund Esmond
Wilmer Price Fitch, M.D.
Mrs. Oliver Filley
William T. Graham
Jean Hallaure
Mrs. J. W. H. Hamilton
Elton Hoyt, 2nd
Walter Hoving
A. A. Hutchinson
J. Ford Johnson
Arshag Karagheusian
Miss Lucy M. Koenig
Capt. Charles H. Lockhart
Mrs. L. G. McMichael
Mrs. George Marshall
Countess Mercati
Clarence G. Michalis
Dr. Paul A. Naef
Miss Josephine Nocera
Ernest E. Nydem
Morgan J. O'Brien, Jr.
A. Perry Osborn
Edward John Paris
Miss Mary Ann Parker
Mrs. Harold I. Pratt
Mrs. Elsie Restell
Theodore M. Riehle
Lady Ribblesdale
W. S. S. Rodgers
Baron Robert Rothschild
Mrs. A. Seton
John L. Simpson
Donald Slesinger
H. E. Talbott
Mrs. Giorgio Uzielli
Dr. Robert Wallis
Miss Edith Wetmore
Sheldon Whitehouse

Junior

Audrey V. Bosworth
Francoise M. Bosworth
Michael Ardagh Cassidy
Gladys Gay Lipton
Michael Lipton
Laura Rockefeller

* * *

Three young Patagonian cavies, the first ever born in our collection, have emerged from their underground shelter and are visible almost every day in the old Prairie Dog enclosure.

* * *

Nesting time is with us again. The usual baby mallards and black ducks appeared on the Bronx River early in May but among the more exotic species, a white-necked crane is hovering a single egg in the Blackbuck Corral and a pair of mute swans are guarding three eggs on the Wildfowl Pond. It will be a brave intruder who violates their nest, for the natural truculence of the birds is greatly increased during nesting time.

* * *

At least two weeks later than usual, because of the cold and rainy spring, our collection of gibbons and spider monkeys have been liberated on Monkey Island in the Bronx River.

THE TIMID GORILLA

In the last issue of Animal Kingdom we mentioned Keeper Reilly's method of weighing Makoko, our male gorilla, who has developed a prejudice against the small bathroom scales used to weigh him and his companion, Oka. Keeper Reilly takes Makoko on his back, steps on the scales, and subsequently deducts his own weight. The process is pictured in the next column, in a photograph by H. Huber Clark.

* * *

More or less as an experiment a young alpaca, born last year, was introduced into the family of young and tame animals in the Children's Zoo this spring. After a period of shyness and timidity that lasted only about twenty-four hours, the alpaca has taken to children — and the food they proffer — with great enthusiasm.

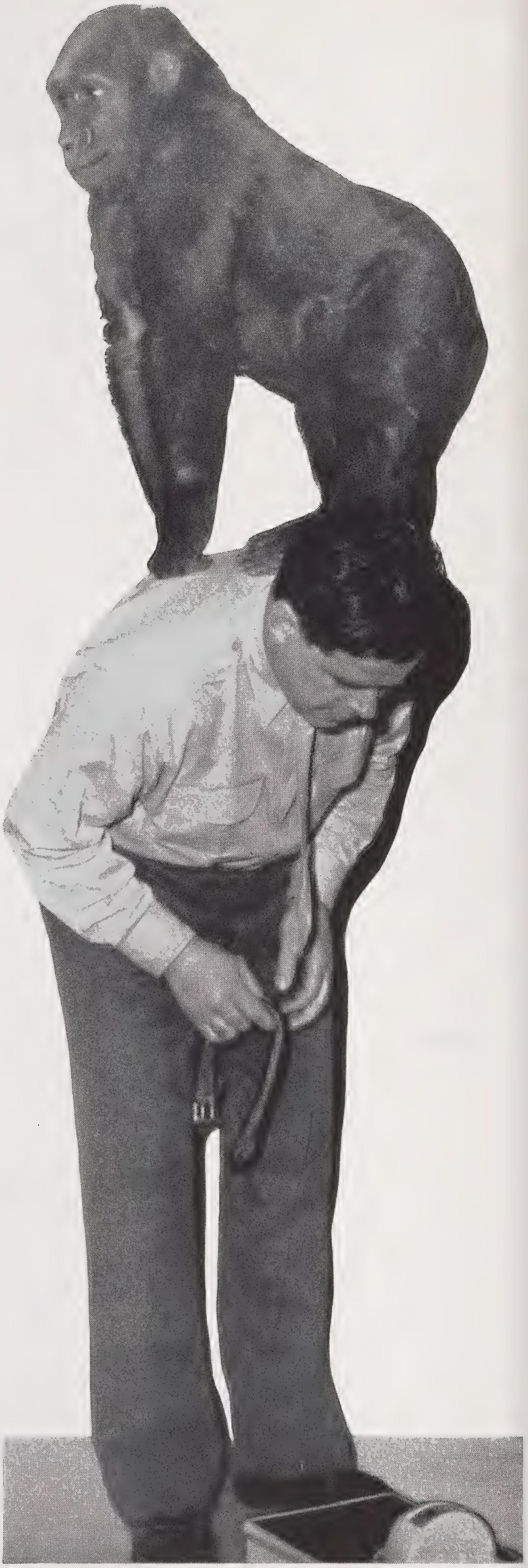
PUBLICATIONS OF INTEREST

BIRDS AND MAN. By Frank M. Chapman. Guide Leaflet Series No. 115. American Museum of Natural History, New York, N. Y. 51 pp., 15 illus., 40 cents.

During recent decades, immense strides have been made in the public relations aspects of our museums and zoos. When we recall the dusty rows of badly "stuffed" birds and mammals that once were considered the last word and then inspect the marvelously realistic groups, prepared and lighted with infinite skill, that now fill entire halls in our modern institutions, they seem completely of different worlds — as of course they are.

Doctor Chapman's newest effort, "Birds and Man," is another step toward bringing sharper realization of our close relationship with nature and to impress the facts strongly on the minds of visitors at the American Museum of Natural History. The present booklet is designed as a guide to this series of superb exhibits. These are grouped as "Birds as Food," "Birds as Clothing and in Adornment," "Birds as Omens and Symbols, in Mythology and Tradition," "Birds as Emblems and Insignia," "Birds as Hieroglyphics," "Birds in Books," "Birds in Art," "Economic Ornithology" and "The Sentiment of Ornithology."

Doctor Chapman has put into these groups all the love and knowledge of his many years of study and research. We shall wait long for a finer exposition of "Birds and Man."—*Lee S. Crandall.*



Going to the Country? . . . THEN YOU OUGHT TO HAVE

SERPENTS
of the Northeastern States

By RAYMOND L. DITMARS

There are many books about the identification of our local snakes, but this is still the simplest and in many ways the most practical for the layman who wants to know enough about snakes to keep out of their way!

It tells —

- *What snakes are found in the Northeastern States*
- *Where they are most likely to be found*
- *What to do if you are bitten by a poisonous snake*
- *How to identify the local snakes*
- *What they look like*—PHOTOGRAPHS OF EVERY ONE OF THEM
- *What they eat*

If you aren't sure you would know a Copperhead—or even a Rattlesnake—if you saw one, there are accurate pictures in color of both these snakes.

60 pages, 41 illustrations *50 cents postpaid*

DEPARTMENT OF PUBLICATION
Zoological Park, Bronx Park
New York City

NEW YORK ZOOLOGICAL SOCIETY

XLVI • No. 4 JULY–AUGUST 1943

[illegible] 78
A 59

ANIMAL KINGDOM

BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

UT OUR LOCAL "LIGHTNING-BUGS," *by Henry Fleming* • BEARS AND THEIR CURIOUS
YS, *by Donald Marcy* • NEWS OF THE BLIND CAVE FISH • NOTES FROM THE ZOO

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field
De Forest Grant
Warren Kinney
William De Forest Manice
David H. McAlpin
Robert Moses
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Eugene Holman
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert I. Gannon
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van	*Executive Secretary*
Jean Delacour	*Technical Adviser*
William Bridges	*Editor & Curator, Publications*
Sanford Miles	*Comptroller*
Claude W. Leister	*Curator, Education*
Donald Marcy	*Associate, Education*
Millward W. Heath	*Supt., Construction & Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall	*General Curator & Curator of Birds*
Claude W. Leister	*Associate, Mammals*
John Tee-Van	*Associate, Reptiles*
Leonard J. Goss	*Veterinarian*
Harry C. Raven	*Associate, Anatomy*
Grace Davall	*Assistant to General Curator*
W. Reid Blair	*Director Emeritus*
William Beebe	*Honorary Curator, Birds*

AQUARIUM

Charles M. Breder, Jr.	*Director*
Christopher W. Coates	*Aquarist*
Ross F. Nigrelli	*Pathologist*
Myron Gordon	*Research Associate in Genetics*
George M. Smith	*Research Associate in Pathology*
Homer W. Smith	*Research Associate in Physiology*
Charles H. Townsend	*Director Emeritus*

DEPARTMENT OF TROPICAL RESEARCH
William Beebe, *Director*

Jocelyn Crane	*Research Zoologist*
Henry Fleming	*Entomologist*
George Swanson	*Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE
NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVI AUGUST 6, 1943 No. 4

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York, N. Y. Title registered with United States Patent Office.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

New Ways to Old Ends

Education has many facets. With this aphorism as a cue we are making a number of experiments this year on additional methods of spreading information to the public in the Zoological Park.

With the mid-season upon us we have grounds for encouragement regarding the success of some of the ideas that are being tried. The most promising is the use of a sound system at various points in the Park to give information about certain of the animal exhibits. So far installations have been made at the Sea Lion Pool, in the new Gorilla House, at the Elephant and Rhinoceros enclosures and at the Lion and Tiger exhibits. Another innovation is a series of pamphlets on animal life, of about 2,000-word length. There are being placed on sale at five cents apiece so that they may be within the reach of anybody's pocketbook. As a minor detail, the reopening of the Gorilla House provided the opportunity of trying out descriptive labels of a different type and larger size than those heretofore installed in any of our buildings.

So far these efforts are meeting with good response; particularly evident is the popularity of the sound system.

The crux of the matter is that only by constant experimentation will it be possible to develop the most effective methods of imparting information for which the public is obviously hungry.

Fairfield Osborn

IN THIS ISSUE

Green-lighted Firefly . . . . *Sam Dunton* COVER
Bears and Their Curious Ways . . . . . *Donald Marcy* 75
What We Have Learned About Blind Cave Fish . . . . *William Bridges* 82
Portraits of Four Primates. III. 83
"Lightning-bugs" . . . . *Henry Fleming* 91
Behind the Scenes: News and Notes 96

SHOP TALK

Maybe somebody has made better pictures of a firefly by its own light than the ones in Henry Fleming's account of "Lightning-bugs" in this magazine, but we doubt it. Sam Dunton, staff photographer, made them.

* * *

Last time, in this space, we advertised for a spare haywagon to supplement our "haywagon taxi" to the Farm-in-the-Zoo. Nobody came through with an offer. Well, we'll try again. We want a dinnerbell for the Farm. To ring at milking time. Has anybody got a dinnerbell he isn't using? It will have a good home at the Farm-in-the Zoo.

* * *

Omniscient Grace Davall, assistant to the General Curator, opened the door and announced:

"It's happened!"

Around a Zoo, anything can happen, and usually does. So we said: "What now?"

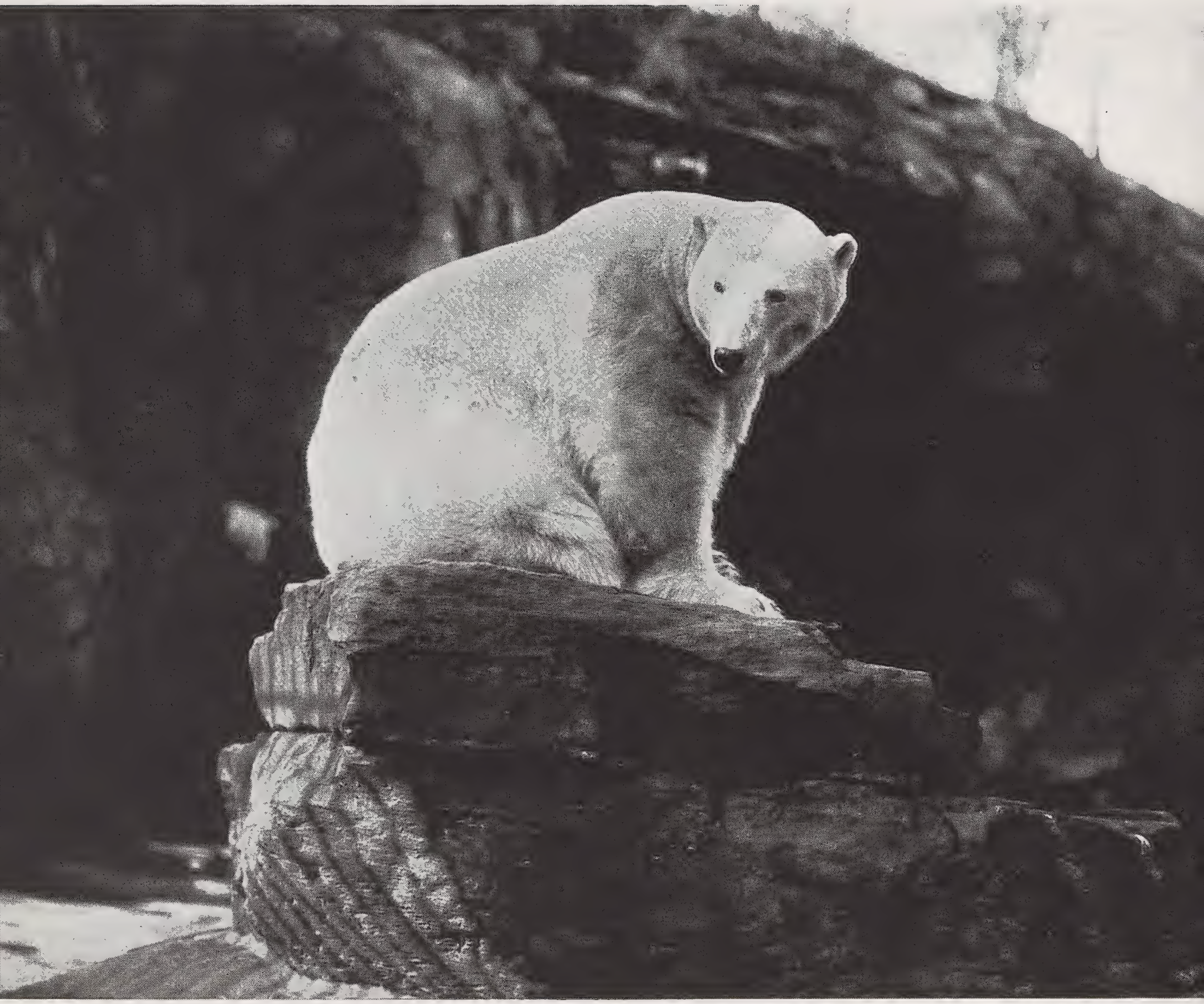
"For blank number of years," said Grace, "I have answered letters from people who have moved to the country or have taken summer places. Thousands of letters. All wanting to know how to get rid of snakes on the farm. And now it's happened!"

"What's happened?"

"Today I got a letter from a man who's moved to a new summer place. He doesn't have any snakes, frogs or rabbits around his cottage. He wants to know how to attract them!"

* * *

Remember that in the previous issue we told the sad story of Annie, the Penguin, and her first egg — the egg that didn't hatch? Well, another pair of Penguins has just hatched two eggs, in the same enclosure. And Annie has been trying to steal the babies. She raided the nesting box a few hours after the first baby was hatched, but was driven off by the father. If she keeps it up, Annie will have to be moved. Kidnapping is a killing offense among Penguins. — EDITOR.



"Silver King" was the finest specimen of the polar bear we have ever exhibited. This portrait of the famous animal (captured by the Rainey Expedition) was made many years ago by Elwin R. Sanborn, and was called by Dr. Hornaday "the best picture ever taken of Silver King."

Bears and Their Curious Ways

The Gigantic Alaskan Species Has the Distinction of Being the Largest Carnivore in the World — More Than 1,500 Pounds

DONALD MARCY

THERE'S something about a bear —

Through the gates of the Zoological Park have passed, at one time or another, most of the strangest and rarest animals in the world. They come and they go; they have their days or weeks or months of public interest, and then they sink to the level of the familiar. But bears, somehow, seem to go on forever.

It happens that our bear dens are somewhat off the main track of visitor traffic. The dens themselves are old and unsightly, so much so that one of the very first post-war projects calls for their complete rebuilding. It makes no difference to visitors. Sooner or later in their wanderings around the Zoo they discover the bears and there a good proportion of them stick — charmed by the tireless antics of the lumbering creatures or perhaps by their sheer size and the power they express.

Whatever the reason for the public interest, it undeniably exists and it has long seemed to us that the bears — particularly the bears of North America, which we are almost sure to have always on exhibition — deserved attention in ANIMAL KINGDOM.

Our four North American species are, incidentally, well represented in the collection at the moment — the black bear in two color phases, the grizzly, the Alaska brown and the polar.

The smallest of the North American bears are the blacks, which range the forested regions from coast to coast. They manage to hold their own fairly well even in the long-populated eastern states, and a recent census of the U.S. Fish and Wildlife Service estimated there were about 3,300 of them in Pennsylvania, 1,400 in Maine, 1,000 in New York, 650 in New Hampshire and 400 in Vermont.

The average weight of a black bear is 200 to 300 pounds. The name "black" bear includes a variety of shades of brown and the common name of "cinnamon bear" is often given to the browner individuals. These sometimes occur in the same litter with really black cubs.

In the wild, black bears, as well as other bears, are shy and usually make a quick getaway at the approach of man, but when wounded, cornered or defending cubs, they are exceedingly dangerous. The senses of smell and hearing of bears are not particularly well developed — they are less effective than those of deer, for example — and the eyes are weak. However, their strength and intelligence seem to compensate for their undeveloped senses. A hunter once killed a bear which was totally blind from old and completely healed wounds, indicating that it had been able to exist for some time without the use of its eyes.

Although classed as carnivores, black bears and other bears are omnivorous feeders. They eat what they can find, depending on the season, and thrive on almost any food. Some of the articles on their bill of fare are berries, fruits, grass, acorns, nuts, honey, ants and other insects, fish, mice and ground squirrels. Large animals such as deer and cattle are sometimes killed and eaten, but such occurences are rare and are usually under the stress of extreme hunger.

Bears are often thought of as being slow, awkward animals, but actually they are well coordinated and finely balanced and can move swiftly if they wish; they are said to be able to run with the speed of a horse for a short distance.

AUG 10 '45

Black bear cubs at play — two of the most active, inimitable clowns in the Zoological Park. Just out of their pool, they spar for position.

Like a couple of wary boxers, they break away and make quick feints with clumsy, swinging paws. Rough play, but not as dangerous as it looks.

The fun generally reaches a climax when one cub chases the other up a tree, with much huffing and puffing.

The fun's over — once at the top, they sniff a couple of times and back down, ready to start all over again.

The broad jump of a fleeing bear over a fallen tree was found to be eighteen feet. If not slowed down by excess fat, a black bear can run up a tree almost with the agility of a squirrel.

The temper of black bears is uncertain and treacherous, even toward other bears, and they usually live solitary lives. Males and females come together only during the mating season in June and July.

During the winter months their food supply is cut off and bears, like many other northern mammals, "den up" in a cave, hollow tree or under a log and spend the cold season sound asleep, living on the excess fat which the body has stored up during the late summer and early fall. It is during the long winter sleep, in midwinter, that the two or three young are born to the female. The new-born cubs are tiny — about eight inches long and weighing nine to twelve ounces — and almost hairless. When one remembers that the mother may weigh around 300 pounds, the small size of the cubs is astonishing.

Grizzly bears are said by some naturalists to be the brightest and most intelligent of the North American bears. They are surely the most inveterate beggars; once they learn that a hungry look and an open mouth will induce visitors to toss them popcorn (or preferably sweet crackerjack) they will pose at the drop of a peanut.

When the cubs are two or three months old, the mother leads them out of the winter den and begins their education. She teaches them many things: how to turn over stones to find grubs, how to dig for roots and bulbs, how to catch mice, and how to climb trees when danger is near. Her orders are enforced by a sharp cuff with her paw which may send the little ones rolling, but if they are in danger she becomes a raging demon in their defense.

Not all of the time is spent on serious matters, however, for cubs are mischievous and frisky and like to play. In the Zoo, the playful antics of bear cubs never fail to attract a crowd of amused spectators. Dr. William T. Hornaday once wrote, in one of our publications, that although small cubs are very interesting, by the time they are a year old they become troublesome and dangerous. "Never buy a Black Bear cub in the belief that it can be kept for amusement and resold at a profit," he wrote, "but if thine enemy offend thee, present him with a Black Bear cub!"

The average weight of adult male grizzly bears is five hundred pounds, and of females, four hundred. Occasionally an old-timer will tip the scales at a thousand pounds or more. The color ranges from black or dark gray to brown and even light brown. Usually the tips of the hairs on the upper part of the body are gray or white, giving the grizzled appearance from which the name is derived. "Silver tip" is another common name of the grizzly.

From the black bears they are further distinguished by their concave facial outline, straighter profile of the back, the broader and more massive head and the longer front claws.

The grizzly bears once roamed over North America from the Great Plains westward through the Rocky Mountains and into Canada, but now they are restricted mainly to the wilder parts of the Rockies. High, rolling uplands with both heavily wooded thickets and open meadows supply an abundance of food and cover, and it is in this type of habitat that they are most likely to be found. Breeding habits and hibernation are similar to those of the black bears.

The grizzlies are believed by many naturalists to be the most intelligent of the bears, and Dr. Hornaday claimed that they are the brightest of any North American mammal. They are peaceful and unaggressive except when wounded or protecting cubs, but in these cases — which might be called justified self-defense — their attack is terrifying in its swiftness and ferocity. The jumps of a wounded grizzly attacking a hunter were found to be fifteen feet long. The actual damage to the victim is done with the teeth and claws; there is apparently no foundation for the belief that bears "hug" their victims to death. Adult grizzlies, because of their size and the shape of their claws, cannot climb trees (though cubs can), and many a disarmed hunter's life has been saved by scrambling up a tree — but one must be quick!

In bear country, trees are often seen which have been deeply scratched by the claws and teeth of bears. Various explanations of these "bear trees" have been advanced by hunters and naturalists, but there is not complete agreement as to their meaning. It may be that the scratching of the bark of a tree by a bear is analagous to our leaving a calling card when we visit a friend.

The food of grizzlies is much the same as that of the black bears. Occasionally a "killer" will appear and cause great loss among domestic animals; one famous old grizzly is said to have killed one cow every other day during the active season for fifteen years (a total of more than 1,200 cows), one daily during the fourteenth season, and thirty-four during one ten-day period! A grizzly will often save food for future meals by digging a shallow depression in the ground, placing the animal in it, and covering it with dirt, leaves and sticks.

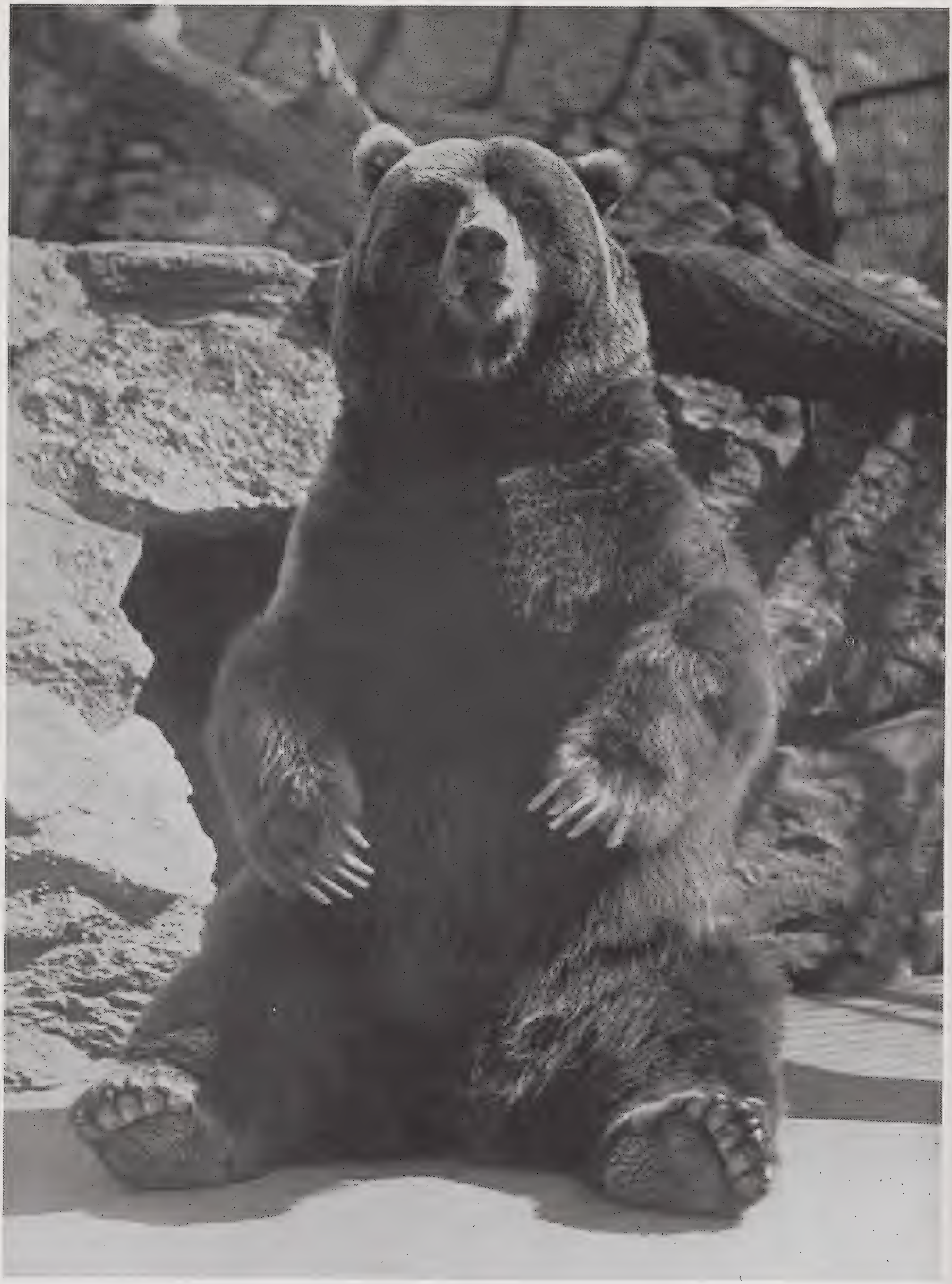
In the Alaskan region is found a group of giant bears which claim the distinction of being the largest carnivores in the world. These are the Alaska or big brown bears, and a full grown specimen may weigh in excess of 1,500 pounds. The color varies from dark to light brown, the claws are shorter than those of the grizzly, and the head is even broader and more massive. For many years sportsmen have been attracted by the great size and reputation for ferocity of the Alaska brown bears, and though many have been killed, their increased wariness and the remoteness of their habitat have kept them from extinction.

During hibernation, high up on a mountain side, two or three 1½-pound cubs are born. When the bears emerge from their winter dens in April they are weak and hungry and food is scarce. At first they feed like cows on green grass and alder twigs. Ripening salmon berries tide them over until the salmon run begins in June. During the summer they forage around for huckleberries, skunk cabbage roots, mice, squirrels, marmots and carrion.

In spite of their great size and strength, the Alaska brown bears living in the Zoo are generally even-tempered and trustworthy, and their keeper enters their cage daily to clean, armed only with a broom. In the wild, they are much like grizzlies — they will usually run away from a man if given the opportunity. But if cornered or wounded, they will attack with lightning speed and terrific ferocity.

How long Alaska browns live in the wild is not definitely known, but one of the Bronx Zoo's former specimens lived thirty-four years in the Zoo, and we have records of two others which lived twenty-eight and twenty-one years.

The latter was a 1,200 pounder named Ivan, a bear with strong personality and engaging habits. When the keeper throws loaves of bread to the bears, he uses a high, swinging arm motion in order to toss them over the nine-foot side of the cage. Ivan learned to stand up on his hind legs and move his huge arm with the same motion that the keeper used. He did this whenever the keeper approached with food, and there was no



"Ivan," a Peninsula Giant Bear (one of the brown bears) was the largest specimen we have ever exhibited. He stood nearly nine feet high and in his prime was estimated to weigh about 1,200 pounds. However, at his death in 1924 the animal's weight was found to be only 800 pounds. He had lived in the Zoological Park since 1903.

mistaking his meaning — he was begging, in his own sign language, for the keeper to hurry up and throw his food in the cage!

Ivan also developed a method of cracking large bones in order to obtain the marrow. He stood on his hind legs and balanced a large bone on the back of his forepaw, then tossed it high into the air. When it fell to the concrete floor of the cage it often cracked open. Sometimes it took a number of trials, but his patience was rewarded in the end.

One day the keeper walked into the den of Admiral, another of our big brown bears. He was wearing a new pair of white rubber boots instead of his usual black ones. Admiral immediately attacked him so savagely that the keeper had to make a quick dash for the door. Admiral would not permit the keeper to enter the cage until the rubber boots had been given a thorough coat of black paint!

Rivaling the Alaska brown bears in size, the polar bears of the icy north may often weigh in excess of 1,000 pounds. The beautiful white or yellowish-white coat which harmonizes with its snowy habitat, the small head, long neck, and wide flat paws with hair on their soles to prevent slipping, distinguish the polar bears from other members of the bear family. Most of them live permanently on the ice, sometimes hundreds of miles from land, and they seldom appear south of the southern border of pack ice. They are excellent swimmers and divers, and are said to be able to swim at a rate of six miles per hour.

With the approach of winter, males and barren females migrate far out toward the edge of the ice and remain active all winter, while pregnant females move inland to "den up" in holes in the snow which they dig themselves. Around the end of March the mother leads her three-month-old cubs out of the den in search of food. Her devotion to her cubs and her energy in protecting them are unmatched — she will even carry them on her back if they are tired, either in the water or on the ice. Sometimes a cub will grasp its mother's tail with its teeth while she is swimming and get a tow — which must present a very comical picture!

While polar bears rely upon seals, walrus and fish for a large part of their food, at times they are said to eat grass, seaweed, roots and lichens. Seton says they also feed on the carcasses of whales left by whalers, and on deer, foxes, birds, eggs, shrimps and mollusks.

In captivity polar bears are usually aggressive and their keeper never enters their cages until after they have been lured into the small "changing cages" with a piece of meat. They do not seem to mind the high temperatures of New York summers, and their large pool of water helps to keep them comfortable on hot days. One of our former specimens, an adult bear when received, spent nearly twenty-five years in the Zoo, while one in the London Zoo lived for thirty-three years and four months.

Bear skins are more or less in demand for making rugs and coats, and the British Army buys the finest skins to use in making the large hats for their Grenadier regiments. Their economic value has decreased in recent years because of reduced numbers, but as late as 1923-24 twenty-five thousand skins were taken for commercial purposes.

The flesh of bears is used for food, but they are not plentiful enough to make any real contribution to the world's meat supply. The edibility of the flesh seems to depend on the condition of the bear and the method of preparing it. Some individuals claim that it is delicious, while others say that it has a disagreeable flavor.

Besides serving as game for hunters, an aspect of their economic value which should not be overlooked is that of tourist amusement. The semi-tame bears in national park areas such as Yellowstone Park afford great entertainment every year for thousands of tourists, who would be disappointed if they were not "held up" by bears which have learned to stop cars and beg for food. But their potentialities must be properly respected and many tourists and campers have had reason to curse the bear tribe for wrecking their camping equipment in order to steal food.

To a limited degree bears may have a beneficial effect on forest growth by "planting" in new locations seeds which cling to their fur or pass uninjured through the digestive tract. In digging for mice, ground squirrels, ants and roots they tend to soften and cultivate the ground so that seeds have more chance of growing successfully. The tearing apart of rotten logs for the insects in them hastens the formation of humus.

When rodents are plentiful, bears help to control them.

Many individuals who know the bears well consider them the noblest of our North American carnivores. Their sagacity, courage and strength is such that man is the only enemy they deign to fear. Their harmlessness, their probable beneficial effect on the economy of the forests, and their general interest as one of the most characteristic of our large native mammals, renders them worthy of the most careful protection to insure the future security of this fascinating group.

What We Have Learned About Blind Cave Fish

After Three Years of Laboratory Experiment, the Aquarium's Mexican Specimens Still Raise Plenty of Problems

WILLIAM BRIDGES

EXACTLY three years ago I wrote in the society's magazine: "The Aquarium Cave Expedition to Mexico this spring will bear important scientific fruits in *Zoologica,* but it may be months or even years before the studies are completed."[1]

Now I think maybe I underestimated. I'm beginning to wonder whether these studies of the curious blind characin of the Mexican warm water caves are *ever* going to be completed. Perhaps by their very nature it is too much to expect them ever to be finished. In the past three years I have edited four papers on those blind fish for *Zoologica* (with the careful reading and re-reading that editing requires) and I have read at least once the three or four papers that have been published elsewhere. Besides, in preparation for the writing of this article, I spent many afternoons with Dr. C. M. Breder, Jr., the leader of the Aquarium's Mexican expedition, in the midst of his batteries of experimental tanks under the roof of the American Museum of Natural History. I read and re-read his summary of three years' work presented to the New York Academy of Sciences this spring.

I came out of it all with the firm impression that by learning one fact about those blind fish, Dr. Breder has merely unlocked a door that let a couple of even tougher problems come strolling in. Research is always like that.

But I should take time here to recapitulate the story of *Anoptichthys jordani* Hubbs & Innes for the sake of new readers of ANIMAL KINGDOM.

In brief, then, a scientific description of a new characin from Mexico — a blind, cave-dwelling little creature — was published in 1936 and four years later Dr. Breder's interest in it blossomed into an expedition to Pujal, San Luis Potosi, to study the fish in its natural surroundings. It was a neat, workmanlike, successful trip. In a little better than a month the blind fish cave, known locally as La Cueva Chica (the Little Cave) was explored from mouth to end, its pools and connecting streams were mapped, and as a grand climax, a series of fish ranging from the previously known eyeless forms right back through imperfectly-eyed forms to their eyed and pigmented relative, the common river fish *Astyanax mexicanus* (Philippi), was seined up, pickled or brought home alive.

It was the first time anybody had ever found such a series of blind, intermediate and eyed cave-dwellers.

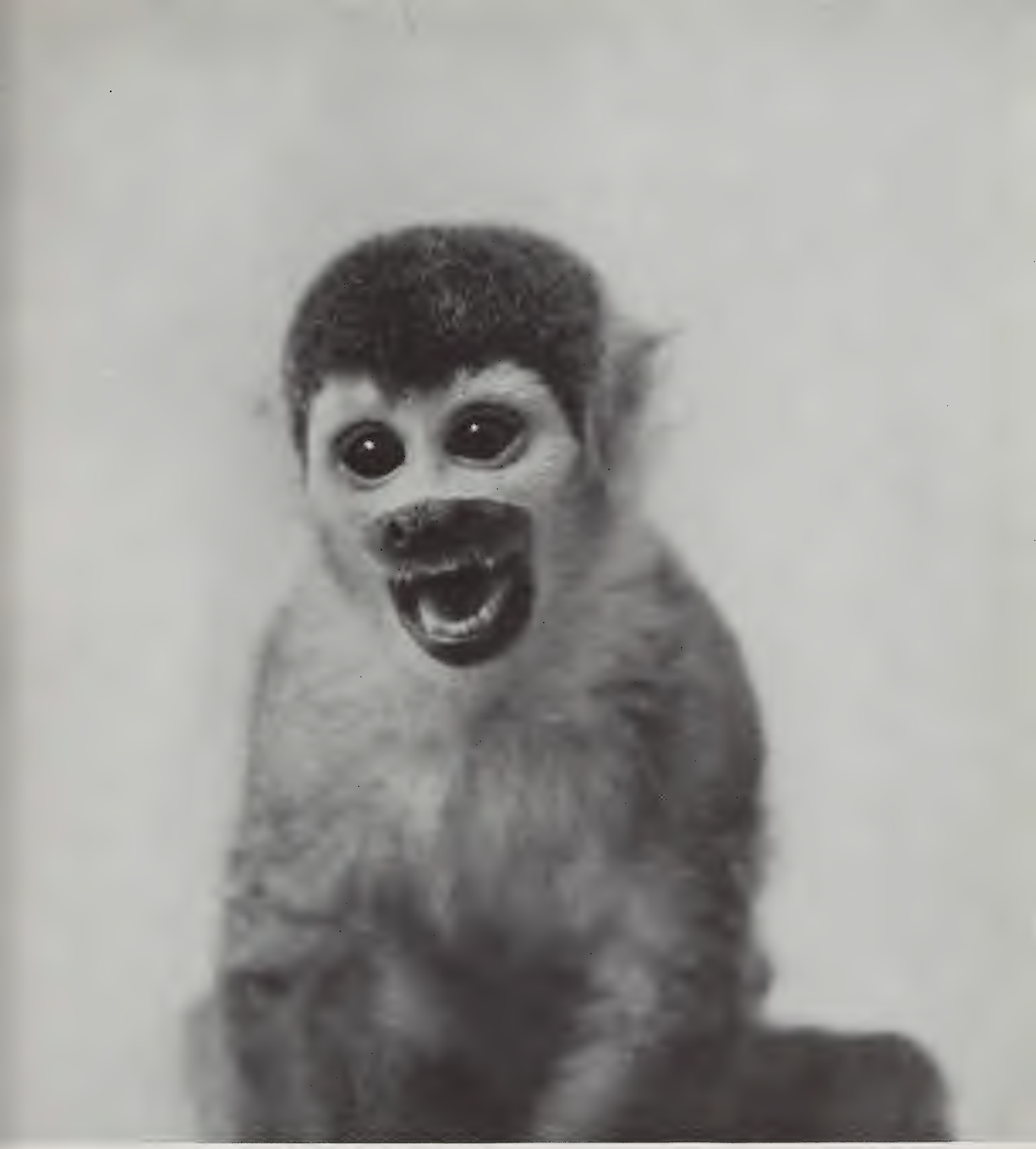
Consider the implications of this discovery.

Until the spring of 1940 about a score of blind and whitish cave fishes were known from various parts of the world — all of them in a "pure" state; that is, while they might have eyed relatives on the outside, there was no living link to connect the eyed and the eyeless. The blind fish were, in effect, a race apart. Evidently the

(*Continued on page* 87)

---

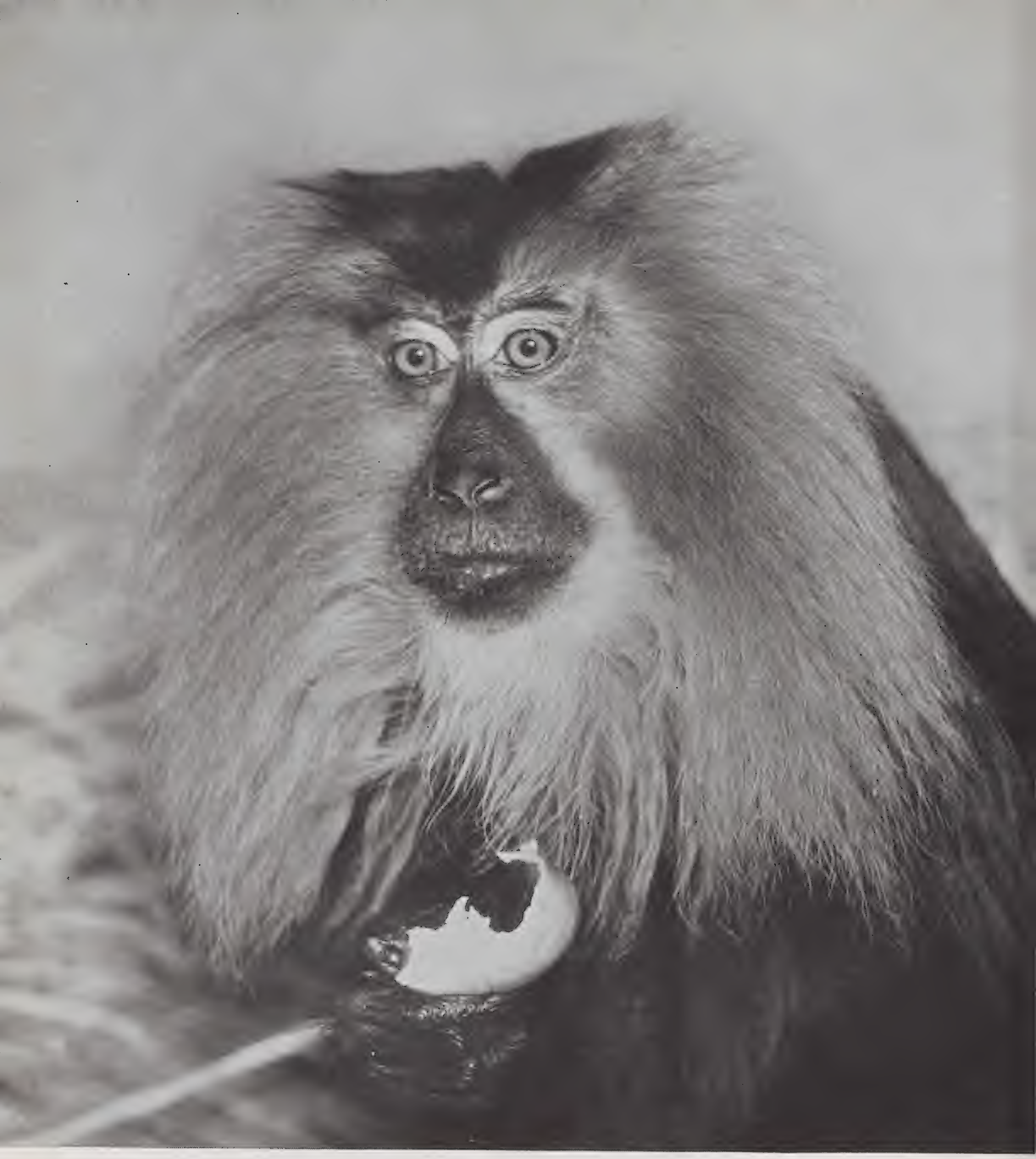
[1] Bridges, W. The Blind Fish of La Cueva Chica. *Bulletin,* May-June, 1940, pp. 74-97.



Portraits of Four Primates. III.

A NATURALIST with considerable experience with primates once remarked that the Squirrel Monkey's face looked more like a little child's than any other monkey's he knew. He said it could look as innocent as a child, and smile like a child, and when it is afraid, its big eyes fill with tears.

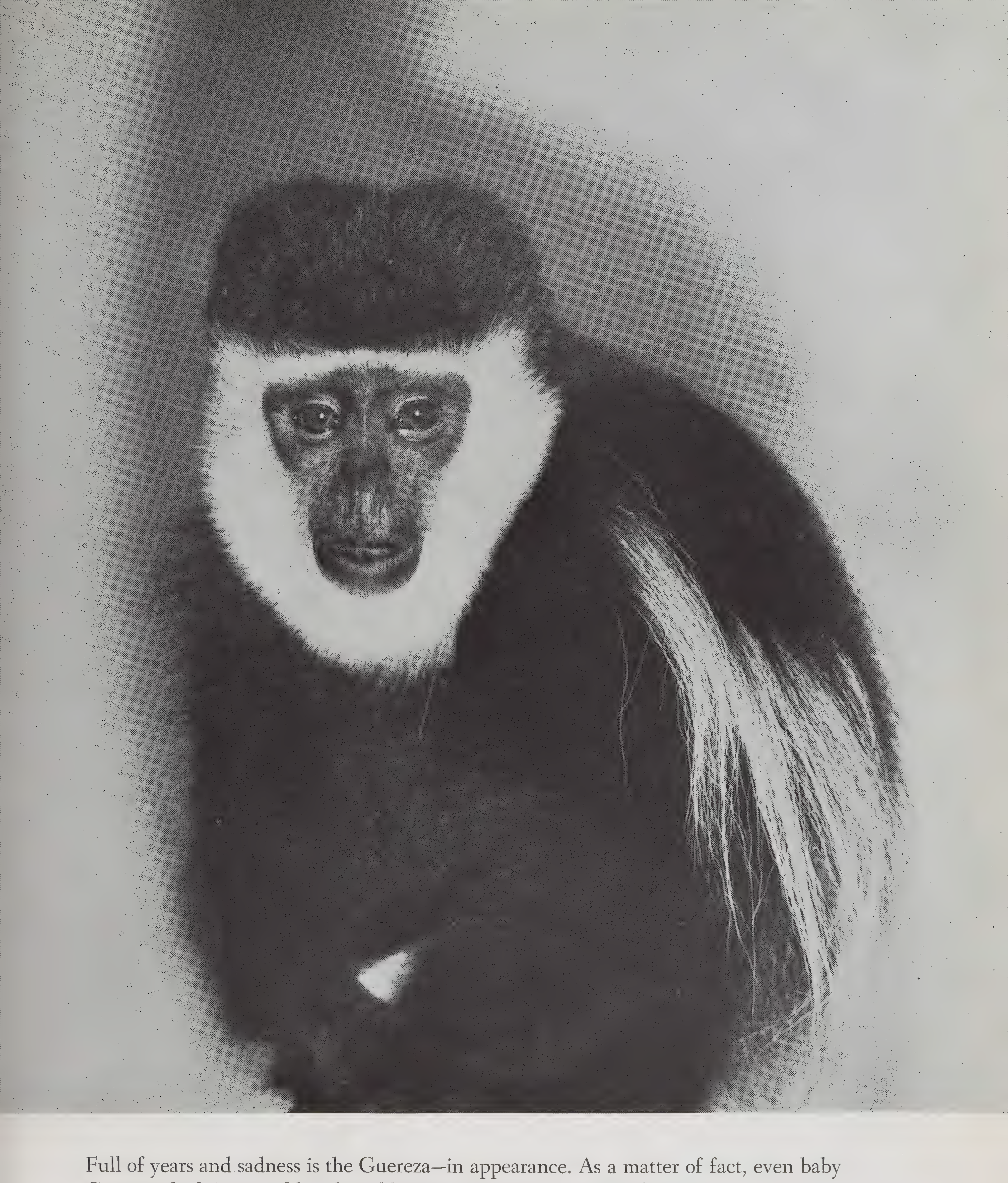
The Indians of South America report that when a hard rain comes, numbers of these little monkeys will huddle close together with their tails twined about their necks. The ones that can't get in the group stand nearby and cry.



If the Wanderoo's tail showed in this picture, it would be apparent why it is often called the "Lion-tailed Monkey." The tail is fluffy and bushy and does indeed resemble a lion's.

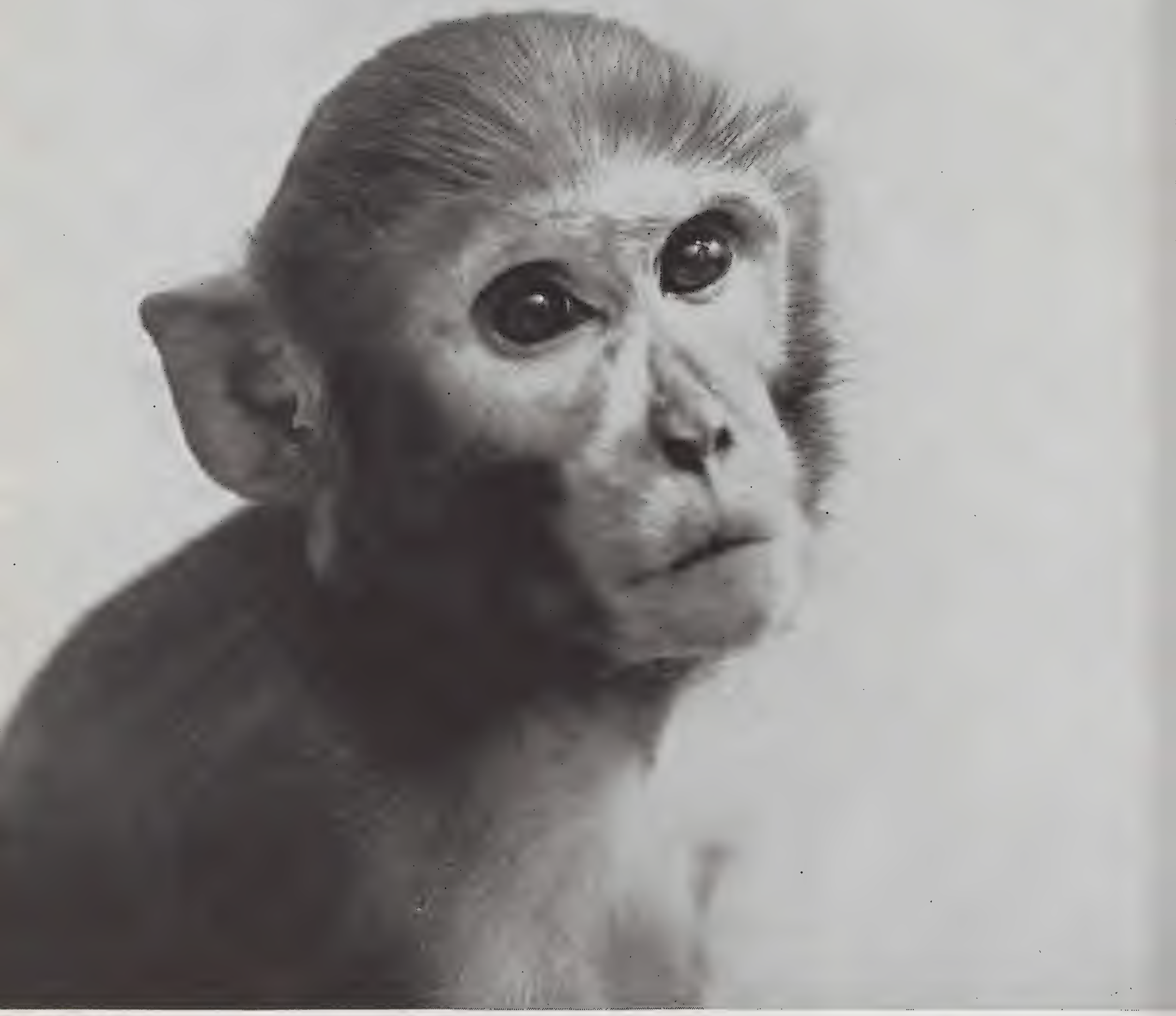
Travelers say the Wanderoo is shy and wary in its native forests of western India, and will gladly avoid letting itself be seen by the natives or anyone journeying through.

Natives are generally very good at making pets of animals, but they are seldom able to train the Wanderoo.



Full of years and sadness is the Guereza—in appearance. As a matter of fact, even baby Guerezas look just as old and world-weary as this five-year-old specimen.

The long white fur on the back is highly decorative and Abyssinian soldiers used to hunt the animal for the sake of the fur, which ornamented their shields.



Wistfulness is not a characteristic of the Rhesus monkey, so it is all the more remarkable that the photographer managed to catch a fleeting expression of reverie on this one's face. For that matter, it is something of a feat to get a Rhesus to stand still long enough to have its picture taken.

In ordinary times, thousands of these monkeys are imported from India for research purposes. They are a favorite in some Zoos, too, for "monkey islands." One drawback is that while most monkeys are as afraid of water as a cat, the Rhesus seems to enjoy swimming.

blind cave-dwellers were derived — somehow — from the eyed fish outside the cave. No one could imagine any other source, but here, in the case of the Mexican cave characins, there was a living chain of intermediately-eyed fish to link the two populations. And there was the material for proving the assumption of relationship.

And furthermore, here for the first time were living fishes, living links, living bits of proof that could be taken into the laboratory to test the mechanism of *how* and perhaps even *why* they came into being.

That is what Dr. Breder has been doing, off and on, for the past three years, first in the laboratories at the old Aquarium in Battery Park and since the fall of 1941 in his quarters atop the American Museum of Natural History.

From its Mexican trip in 1940 the Aquarium brought home only a handful of living fishes — 13 of the cave-dwellers, mixed blind, intermediate and eyed forms, and 11 of their eyed relatives from the nearby Tampaon river — but they were enough to start the investigation rolling. Some of the completely eyeless fishes had been on exhibition at the Aquarium since 1936, and plenty more were available in a Florida hatchery where a breeding stock was being maintained. Several tank-bred blind fish have been acquired by Dr. Breder from this hatchery from time to time, and among his collection of hundreds of specimens, in all stages of eyelessness, he has some blind fish that are seven generations removed from the warm, dark waters of La Cueva Chica. But they are still blind.

Six major lines of investigation have been carried on more or less simultaneously and the simplest method of reporting what has been learned about the blind cave fish seems to be to take up each one in turn. Several of them are still in such an active state with findings still in the manuscript or laboratory notebook stage, that very little can be said about them yet.

I. *Reactions to Light*

From such simple experiments as the Aquarium party could make in the field there was no doubt about it — the blind fish were unmistakably blind.

"Even the brightest lights had no effect on them," I wrote in the BULLETIN in 1940. "How could they, when their eye structure was a mere jumble of ineffectual tissue? It was easy to test their unresponsiveness to light. Time and again we picked out an aimlessly-swimming fish and played the concentrated beam of an electric torch around it, ahead, behind, to the side and on it. The random cruising of the fish never changed. Whatever the course it had set as it slowly circled a small area of the pool, the presence or absence of light caused no deviation in its movements."

Well — that was admittedly an insufficient sort of experiment, and not at all conclusive. But the conclusion that the blind fish gave no response to light was based on something more substantial — the careful dissections of *Anoptichthys* eyes that Dr. Breder and Dr. E. B. Gresser of New York University had made before the collecting party left New York. They knew that while the fish's optic nerves left the brain and entered the eye sockets, they ended in mere capsules and never went on to form the complex eye structure necessary for even imperfect, vague sight.

It was a safe assumption that the fish could not see in the usual sense of the word, but did they have any sensitivity to light at all? Even if they went on aimlessly circling in the strong beams of the flashlights in La Cueva Chica, was it certain that they had no method of choosing between the blackness (and comparative security) of a cave, and the sunlight (and instant danger) of the open waters outside? The fishes' own safety and preservation would seem to demand some sort of a response to keep them in the warm darkness where they would be safe.

Obviously, there might be several other safeguarding "tropisms" at work, but a nicely-calculated experiment to determine their response to light and darkness seemed in order — just to make sure.

So Dr. Breder and Dr. Gresser set up what is called a "gradient trough" in the laboratory. In essence it was merely a long tank with one end open to the sunlight and the other end covered to simulate the darkness of a cave.

They found that the "blind" fish spent more time under the cover — in the dark end of the trough.

Those abortive eyes, those mere capsules actually buried in indifferent tissue where the eye should have been, were of some use, after all.

In this great battery of experimental tanks (only part of which are shown) Dr. Breder is carrying on some of his experiments with the Mexican blind cave fish at the American Museum of Natural History. The fish readily adapt themselves to life in quite small tanks.

They gave the "blind" fish a liking for the darkness in which they were found.

As I said earlier, finding out one thing about *Anoptichthys* only raises a couple of new questions.

Now, what use is light sensitivity to a cave-dwelling fish?

Well, it might play a part in keeping them in the cave where they were safe. Even if there was nothing else to prevent it, they would be inclined to turn back toward the shelter of the cave if they happened to get to the exit of the cave, where the cave waters flow into the Tampaon. Coming out of the underground stream, they would encounter the light of the open water and be turned back.

II. *Rections to Temperature and Water Flow*

A little way back I said there might be several "tropisms" at work to keep the blind fish in the safe shelter of their cave. Besides reactions to light, two more of these now have been demonstrated — the desire of the fish to swim upstream when there is even a very slight current, and a movement into warm water when there is a choice between temperatures as small as a degree and a half.

As a matter of fact, both the blind fish and the normally-eyed river fish react the same way to temperature and water flow.

These two facts suggest how the fish happened to go into the cave in the first place.

Both in the laboratory at the Museum and in a garden pool at his home Dr. Breder worked out details of these patterns of behavior. But before he discovered the compelling interest that temperature has for the fish, he was puzzled by their actions.

When he first placed blind and eyed fish in his garden pool (one end of which was covered to form a miniature cave), he had already demonstrated in the laboratory that the fish have a "negative photo-taxis" — that is, that they had a tendency to retreat from light.

It is easy to imagine his surprise, then, when fish that had been hiding in the "cave" end of his garden pool emerged into the bright sunshine during the heat of the day. When night came and both ends of the pool were almost equally dark, the ghostly little fish crept back into the shelter of the cave!

What was happening, of course, was that the sun warmed the open water of the pool in the daytime and its temperature rose above that of the water covered by the roof of the "cave." The reaction against light was not strong enough to prevail against the attraction of warmth, and the fishes emerged. At night, the open water gave off its heat more rapidly than the "cave" water, and the fishes reacted in the same way as before – they moved toward the warmer water. Both eyed and blind fish reacted in this way.

Dr. Breder also discovered that a slight flow of water would make the fish – both blind and eyes – swim upstream. Even normal river fish, that had never experienced cave life, showed the same tendency to enter a simulated cave if there was a mild flow of water out of the darkness.

Thus, by these experiments, Dr. Breder had demonstrated two factors that could influence ordinary, eyed river fish to enter such a cave as La Cueva Chica, and to stay inside:

1. They prefer warm water as against water only a degree and a half cooler – and La Cueva Chica happens to be a warm-water cave, heated from beneath by magmatic layers close to the surface. It is true that at the time the Aquarium party visited La Cueva Chica, the temperatures inside were practically the same as those in the river, but at other seasons the cave waters would surely be the warmer.

2. They prefer to swim upstream – and the waters of La Cueva Chica flow out, underground, into the Tampaon River. Thus there is a constant outward flow that would act as a magnet on these sensitive fish.

These two factors, plus the light avoidance of the blind fish, should serve to make both kinds remain in caves such as this one.

III. *Other Senses of the Fishes*

When Dr. Breder undertook the investigation of the Mexican cave fishes, he hoped to get from them a better understanding of the evolutionary process that produced them. In particular, this seemed a good chance to study *behavior* and its role in evolution.

"As a matter of fact," he said at the beginning of his work, "ninety per cent of evolutionary study has been based on the study of form. But morphology – form – isn't all; it seems to me it is equally important, if you are studying a machine, to know what it does as well as what it is."

Some of the elements in the behavior of the fishes Dr. Breder could study in his own laboratory; others he asked specialists to work on. Dr. Daniel Merriman of the Bingham Oceanographic Laboratory undertook a study of the internal ear and the lateral line.

Dr. Merriman's studies are still going on and beyond the fact that he has discovered that the fish's ear is degenerate, it is not possible to report any of his findings here.

IV. *Taste and Smell*

A most laborious investigation of the tasting and smelling organs of the fish has been going on in Dr. Breder's laboratory for months and before the year is out should reach the stage of publication. Nothing more can be said now. The burden of this study has been carried by Miss Priscilla Rasquin, formerly of the American Museum, who is associated with Dr. Breder in this phase of the general problem.

V. *The Brain*

Dr. Ralph Meader of the Department of Human Relations of Yale University has in hand the task of studying the brain of these fishes but it will probably be a long time before his studies near an end. To date, many microscopic sections of the brains have been made. They are being studied.

VI. *Genetics*

Naturally, an important field for study is the one that involves the genetics of the cave and river fish. Fascinating as it is to study the behavior of an animal and to discover what it does and the rules by which it lives, the geneticist is the man who must be relied upon to figure out the "how" of the inheritance of its physical modifications.

More or less from the very beginning, a genetic study of the cave fish has been in progress and the end is a long, long way off.

As simply as I can state a complex situation, here is what probably has happened.

For untold generations the Tampaon river has swarmed with the common little fish known scientifically as *Astyanax mexicanus*. (It has no common name). And it happens that this species naturally exhibits more variation in the size of its eyes than do most fishes.

Now, suppose that at some time perhaps many fish-generations ago some individual river fish found themselves at the point where the underground waters of La Cueva Chica boil out into the bed of the Tampaon river.

We know that even the fully-eyed river fish have no hesitation in entering darkness. The underground exit of the cave waters offered them darkness.

We know they have a disposition to swim upstream against a current. The outpouring waters offered such a current.

We know they will react toward warmer water — and the cave waters at certain seasons are warmer than the outside waters.

These factors would work together to inveigle any river fish into the cave. And once inside, the conditions of cave life — warm water and a current flowing outward — would conspire to keep the fish there.

Now, if we remember that the normal, eyed river fish have an hereditary predisposition to eye variations, it seems quite possible that occasionally some of them are hatched with really serious eye defects. Nobody fits baby fish with glasses; in the open water they die off quickly if their eyes are not up to the job of finding food and warning of enemies.

But in the complete darkness of a cave, eyes are not important at all. Predators are fewer, or handicapped by darkness to the same degree as weak-eyed or blind fish. And so, when a serious eye defect showed up among the fish in the cave, the merry complications of interbreeding tended to preserve it and even to extend it in the favorable cave environment.

That is where the geneticist comes in. It is his job to work out (if he can) the jumble of genes that produce all the variations in eye development that have been found in the waters of La Cueva Chica.

We know that the completely blind fish breed true. Cross a pair of blind cave fish and all the offspring are blind. That holds good even if they have been reared in full daylight; the offspring of seventh-generation-daylight-reared blind fish are just as blind as the original cave stock (as any geneticist would anticipate).

Possibly some of the intermediately-eyed fish found in the cave are the result of recent crosses between blind and eyed fish or maybe they are simply fish that represent steps in the evolution of the completely blind form. Dr. Breder would like to test these two ideas — and others — in his tanks, but there are difficulties. Other fish eat the eggs if they are deposited in a tank without planting, to make observation easy. If the eggs hatch in a planted tank, it is difficult to see the young, or they are eaten by other fishes.

Ideally, of course, Dr. Breder would divide himself into three or four persons and sit beside his tanks day and night to see when spawning occurs, remove the other fish, and watch the young develop. He hasn't been able to do that yet.

Some way of making an isolated cross between a blind fish and a fully eyed fish, rescuing the eggs before their parents eat them, giving them the right conditions for hatching and then preserving the young until they can be counted and examined under a microscope is one of Dr. Breder's forthcoming tasks.

If he is successful, he will have a notebook full of genetic data that will certainly be the springboard for a whole new series of experiments and conjectures. That is why I think this investigation is probably never going to end!

* * *

Just as a footnote to this article, it should be mentioned that since the Aquarium expedition visited La Cueva Chica in 1940, other collectors have found another form of blind characin in the Cueva de los Sabinos, fifteen miles from La Cueva Chica. This fish has not yet been described in scientific literature. It has its own set of puzzles — no intermediate forms have been found — but living specimens have been brought to New York and are being studied. Maybe they will furnish some new answers to old puzzles and give an end to the main problem. But I doubt it. More likely, after the war there will have to be about six months of hard, slogging field work. More fishes — more data — and more puzzles.

Six flashes of the Green-lighted Firefly produced this striking photograph which silhouettes the abdomen of the beetle and shows the back-flare of the light. This is the first firefly picture made by Mr. Dunton.

"Lightning-bugs"

Five Species of Fireflies Are Most Commonly Seen in the Mid-Summer Fields in This Region

HENRY FLEMING

If I were a painter instead of an entomologist, I should like to attempt an almost-impossible picture. I should like to paint a June night with fireflies.

Whistler might have done it. Indeed, he almost did in his Cremorne "Nocturnes." In the deep crepuscle, the glow of the chains of lanterns is very like the glimmering of enormous fireflies. But he chose a moment between dusk and night, and *my* picture would attempt to transfix the velvet blackness of an early summer night with a thousand winking, burning spots of green and yellow.

It would be sure to be misunderstood. It would be mistaken for an impression of an anti-aircraft barrage. Or a pilot's view of a faulty blackout.

No matter; I am not a painter, and my only purpose in evoking such a scene is to bring to my readers' minds the pictures we must all have stored away, of scented gardens and still fields all blossoming with the luminous, mobile flowers of the night, the familiar fireflies.

It is surprising how little we know about fireflies, and of that little how fractional is the information that is of general, as distinct from technical, interest. To know that fireflies are beetles, that they belong to the family Lampyridae and are related to the soldier beetles and that there are some fifty species of fireflies in the United States alone — in every State — is enough basic information to start one on a search through a mountain of books and isolated scientific papers. The hunt is almost as vain as swinging a collecting net with one's eyes shut.

As far as I can discover, there are no common names to differentiate the five species of fireflies most generally seen in this corner of the United States. All are known by the one shotgun term of "firefly" or "lightning-bug." It is an unfortunate lack, but the vast majority of all insects are under a similar disability, and it would be a brave entomologist who would attempt to do anything about it on a wholesale scale.

Nevertheless, since I hope in this article to lay down some simple rules by which the various species of fireflies can be differentiated, I am willing to attempt the naming of them. After all, these five species of lightning-bugs probably look less alike than the Dionne quintuplets did at birth, and yet Père and Mère Dionne faced the task of naming *them* and telling them apart!

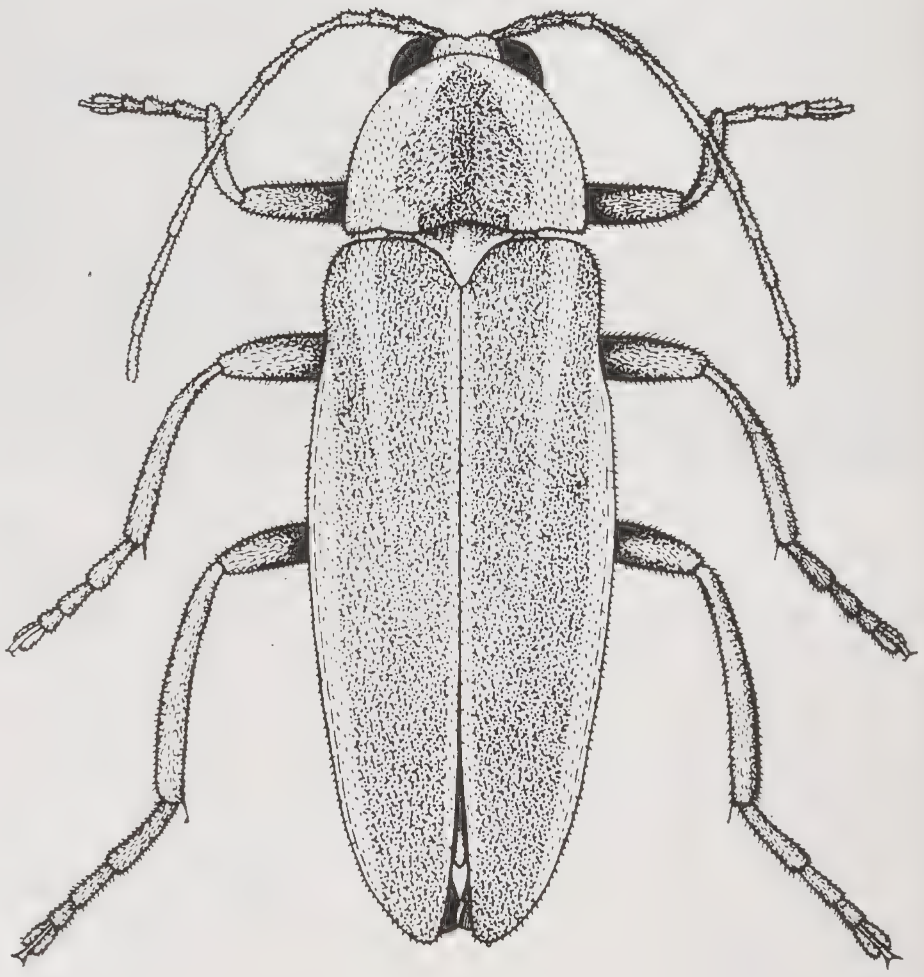
Solely for the purposes of this article (since I have no expectation that any considerable number of persons will ever want to pose as firefly experts), I list the five species under discussion, and give vernacular names by which I shall refer to them.

Scientific Name	Vernacular Name
Photuris pennsylvanica	Green-lighted Firefly
Photinus pyralis	Flashing Firefly
Photinus scintillans	Glowing Firefly
Photinus consanguinius	Double-flash Firefly
Photinus marginellus	Burning Firefly

For reasons that will become apparent when I discuss the light rhythms of these curious beetles, these vernacular names are not very satisfactory. They are simply an approximate expression of the color of firefly light, or of its flash-tempo. And these, especially the tempo, vary to a disheartening degree.

In this latitude fireflies make their appearance about the end of May and the beginning of June. As insect lives go, theirs are long; they flourish until the end of August. Before Labor Day the last light has been snuffed out, but the busy, purposeful summer has been well employed. Through the romantic medium of their flashing signal-lamps, the males and the females have found each other. On leaves, among grass roots, in minute cracks in the ground, the luminous eggs have been deposited and the complex mechanism that next summer, or the summer after, will populate the June world with fireflies is already in operation.

The glowing spheres that the female firefly deposits are, so far as we know, laid singly and not in clusters. The egg's feeble light is shed for only a few hours; then the fire is gone from its surface, but life has been stirring inside it. In three weeks or so the larva emerges from the egg — an undistinguished little worm, hard-shelled, often mistaken by Victory gardeners for the baleful wireworm.



After Hess

The Green-lighted Firefly (*Photuris pennsylvanica*) is by far the largest of the local species; note how its black head protrudes from the "shoulders."

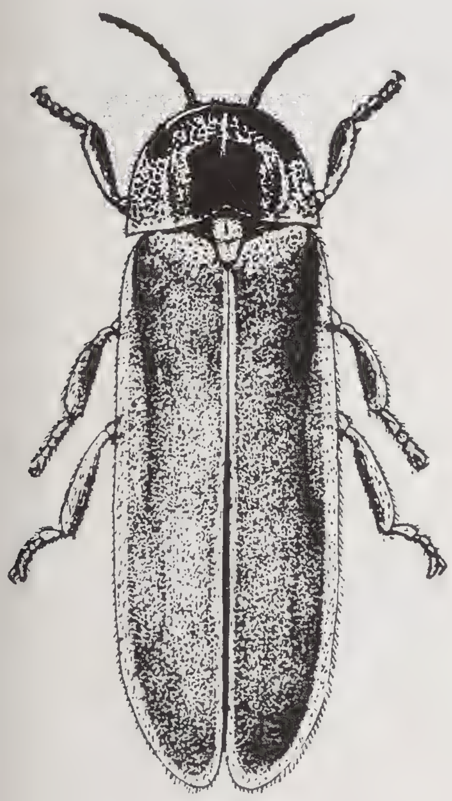
The prime business of the grub is to eat and eat and eat again. To grow is its aim in life, and it must forage constantly among the snails, earthworms, grubs and such small deer of the grassroots in order to put on size, even though the net result is only an added few millimeters of length. It is likely that the firefly grub lacks a sense of smell, for it seems to seek out its food by a constant casting about of its antennae. Once the delicate "feelers" make contact, the tiny creature lunges forward, mandibles opening and closing. They sink into the flesh of the victim and pour out a minute quantity of a poisonous brown fluid, which not only paralyzes the victim but liquifies the flesh so that the grub may feed more easily.

Apparently food is not too plentiful within range of the firefly larva's antennae, or else the creature has a low rate of growth, for it sometimes takes two seasons for it to get its full stature of about one-quarter to three-quarters of an inch, depending on its species. Larvae hatched from the egg this summer may be ready for their next stage in life by the coming of cold weather this fall; on the other hand, they may have to hibernate and resume feeding next summer before preparing for their greatest change.

When the grub has fed its full, it creates a clay dome about itself and goes into a fretful sleep. The winter passes, the grub's form changes inside its capsule, and then comes the warm May evening or the scented June night when the shell cracks and the transformed grub soars upward, winged and flashing its species rhythm—a firefly.

* * *

When our hypothetical firefly of the preceding paragraph "soared upward," that fact of flight stamped it as likely to be a male. Both males and females of the big Green-lighted Firefly take to the air; the females of the other common species all have wings but seldom or never use them, except the Glowing Firefly. The female of that species is wingless and completely earth-bound.

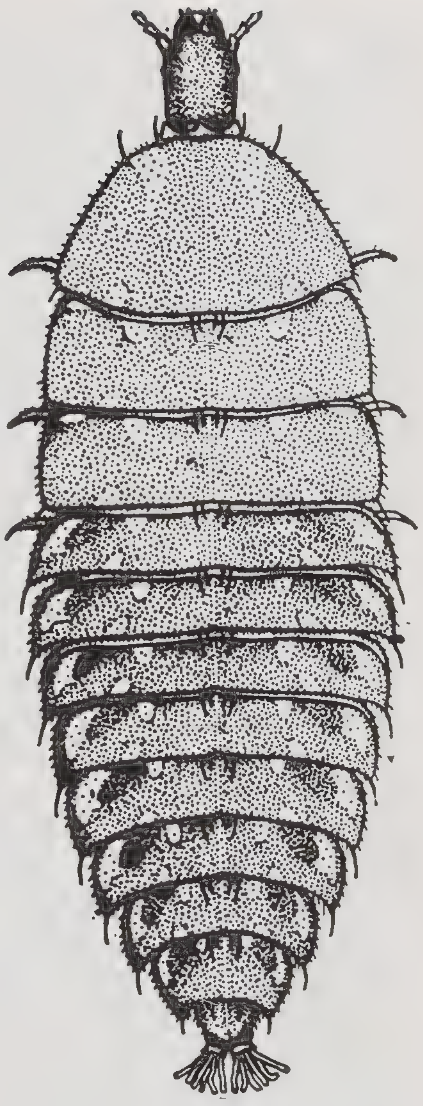


The Flashing Firefly (*Photinus pyralis*) is common in many areas and is next to the Green-lighted Firefly in size.

After Hess

Although to our eyes it may seem that fireflies are almost always on the wing when their "day" begins at dusk, and that thus there is little chance for romance developing between the flying males and the grounded females, their lights serve to bring them together at a trysting place on a leaf, a stem or a blade of grass.

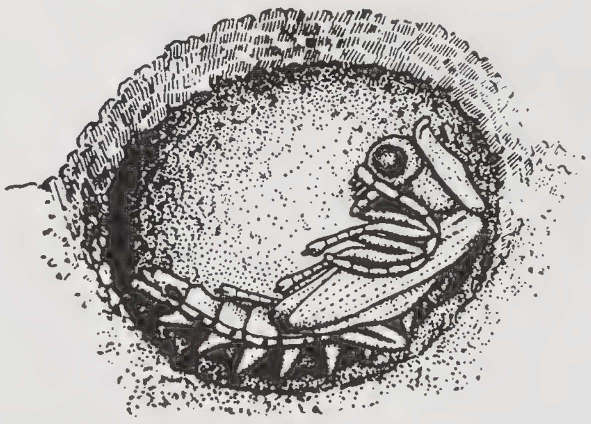
On her little perch at the tip of a blade of grass, the female winks with a feeble but definitely "come-hither" light. The bold flashing of an air-borne male within a few yards of her is enough to set her off and cause her light to blink. If the rhythm and tempo — or some other delicate factor of which we have but little knowledge — are those of his own species, the male may swoop down and investigate. Back and forth, one signaling and the other answering like a couple of destroyers searching each other out with blinker lights on a murky night, they exchange their messages of courtship. If all is satisfactory, the male alights and waves his antennae until he encounters the female. Then the flashing ceases and mating takes place.



A typical firefly larva—in the stage when its chief purpose in life seems to be to eat and grow larger.

After Hess

It is sad to have to record that the female of the Green-lighted Firefly is a siren luring unsuspecting males of other species to their death, but such is often the fact. The flash rhythm of the Green-lighted Firefly is so variable that it may on occasion happen to imitate that of most of the other species. Her signal may be answered by an amorous male of the Flashing Firefly or the



Firefly pupa in its cell, awaiting transformation to its winged state.

After Hess

Double-flash Firefly, and the moment they encounter the female they find themselves seized by strong jaws and devoured. Incidentally, there is little other evidence of the food of fireflies; some investigators suspect that the males of our species eat minute portions of greenstuff.

Perhaps the most interesting and most puzzling of all firefly phenomena – besides, of course, the nature of the light itself – is their habit of flashing in unison.

It is not a frequent phenomenon locally. A few dozen observations have been reported elsewhere, but it is probably far commoner than published reports would indicate. The aftermath of a heavy thunderstorm seems to be a favorite time, when the air is heavy and damp and still with an unusually large number of fireflies hovering over a low meadow.

At one moment the meadow may be pitch black, a void, and at the next lit up by thousands of pin-point lights. The performance may cover the whole of a large field, or it may be of a rolling type, so that synchronous flashing starting at one end will proceed across the field like a wave. Off and on, off and on, the lights wink simultaneously for as long as five or six minutes.

So far there are several theories to explain what sets the lightning bugs off simultaneously, and why they stop when they do, but no one of them is entirely satisfactory. Incidentally, a Siamese firefly is said to synchronize for hours and to resume rhythmic flashing night after night. Our local fireflies are not that energetic. The Green-lighted Firefly keeps its lights going until almost dawn, but the others generally quit by eleven o'clock and seek rest under leaves or in the grass.

As I said a moment ago, the nature of the light of a firefly is one of the prime secrets of the insect world. Many thousands of words have been written about the cause, the method and the reason for the light, and to all intents and purposes naturalists are not much further along than they were in the beginning. It is, however, known that the light of a firefly is not wholly without heat, as was believed for a long time. The quantity produced is extremely minute but it can be registered by modern apparatus. Heat is, in one sense, wasted light and the firefly's efficiency as a light-producer is tremendous compared with the best man-made apparatus.

We know that the light-producing organs are on the underside of the firefly's abdomen, that there are two layers of tissue, one photogenic and the other a reflector. The light is the result of the oxidation of body wastes collected in the reflector layer. Apparently, oxygen and water and a photogenic protein are all that are necessary to produce firefly luminescence, but these seem to be consumed in such large quantities that they would not be very practicable on a commercial scale. What man lacks is the lightning-bug's "know how."

* * *

When I embarked on this article, I thought it would be interesting to work out a simple key by which the amateur could identify the common fireflies of this region. It would be interesting, all right, but almost impossible – at least to make a simple key.

However, since only five species are likely to be noticed around New York, a few hints at a beginning of separation of the various kinds can be given here and can be applied by anyone.

The Green-lighted Firefly is easily the largest of all our fireflies – half an inch long, or even more. Its light, both in the male and the female, is definitely greenish. Furthermore, if there is any question, and a specimen is in hand, one can see without the use of a magnifying glass that the head projects beyond the "shoulders"– the forward segment from which stem the two forward legs. In all our other local species, the "shoulders" (the prothorax) hides the head, looking at the firefly from above. To tell whether the head projects, wait until the firefly is at rest – not walking in one's hand.

The next largest firefly, and one that may at first glance be mistaken for the Green-lighted, is the Flashing Firefly. It is slightly smaller than the Green-lighted and its head is hidden. Besides, its light is yellowish, like that of the Glowing, the Double-flash and the Burning Firefly. The Flashing Firefly's head is thrust forward while it is walking, so that it resembles the Green-lighted Firefly, but it disappears when the beetle is at rest.

In solemn recognition of the fact that I am sticking my head in a noose, I am going to attempt a "flash chart" for the casual recognition of our five fireflies. No scentist would depend on

A particularly brilliant specimen of the Green-lighted Firefly produced this silhouette in six flashes. A round, curved reflector under the beetle concentrated its light and gave the image a circular effect.

such a crude device – but, then, no scientist would need to. He would have rows of specimens, microscopes and all the apparatus and technical keys necessary to make identification positive. The readers of this article are not likely to want to be so positive. It may add interest to a summer's evening in the country to try to separate the various flash-rhythms and to know that, probably, one has seen the Flashing Firefly, the Double-flash Firefly, or whatever it may be, at its evening's work.

Here, then, is the chart –

GREENISH-BLUE LIGHT

GREEN-LIGHTED FIREFLY

Male Signals: - - - or - - - - or - - - - - (Sometimes, for a reason we do not know, when the Green-lighted Firefly is circling a bush or tree, it will emit one long flash, holding it about twice the length of an ordinary short flash, like this: —

Female Signals: - or - - or - - -

YELLOWISH LIGHT

FLASHING FIREFLY

Male Signal: - (The signal of the female is presumably the same as that of the male).

GLOWING FIREFLY

Male Signal: — (Female presumably the same).

DOUBLE-FLASH FIREFLY

Male Signal: - -

Female Signal: - -

BURNING FIREFLY

Male Signal: —

Female Signal: - —

The vernacular names I have arbitrarily given these fireflies are, it will be seen, based roughly on the characteristics of their lights. *Photinus scintillans,* for instance, I called the Glowing Firefly because its signal is a long glow of fire; *Photinus marginellus,* since its light also is long, I called the Burning Firefly to express the same idea. *Photinus pyralis,* quick and short in its rhythm, more nearly fulfills the name Flashing Firefly than some of the others.

I earnestly advise young entomologists to have recourse to their microscopes and formal keys if they want to make a career in the study of the Lampyridae. But for others whose aims are simply enjoyment, the "flash chart" may be the makings of an evening's amusement.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

LIFE

Mrs. Kermit Roosevelt
Lewis S. Rosenstiel

ANNUAL

Henry B. Abrahams
Leon Balsam
William A. Bandler
David Bunim
Donald Angus Cameron
J. B. Deacon
M. L. Dreyfus
Elly Erdmann
Charles Frank
Crosby Gaige
Mrs. Richard Gambrill
Samuel Gates
Leo Gerngross
Herbert Haseltine
Max J. Halpern
Diana Hass
S. D. Hesse
Clarence H. Heyman
Ralph T. Heymsfeld
Adolph Hirsch
Duncan A. Holmes
Lester B. Jacobi
R. Lincoln Jordan
L. A. Heidel
Ralph C. Ketcham
Otto Kleppner
Alexandra Krastin
Marjorie Lane
J. L. Leban
Edmund Lissberger
Mrs. George Marshall
W. J. Murray, Jr.
Fay Nash
Ernest E. Nyden
Jean Palmer
Richard Patterson
Ignatz Reiner
Mrs. Elsie Restell
Jerome Roth
Margot Schwarzhaupt
Milton B. Seasonwein
Mrs. W. D. Shackleton
I. J. Seskin
Frederick H. Warner
Theodore C. Wiehe

JUNIOR

Hartman J. Bittorf
Leo M. Spichler

"PETE" IS 40

"Pete," our two-and-a-quarter-ton hippopotamus, was 40 years old on July 13 and is the second oldest hippopotamus on record among the zoos of the world. The Paris Zoo in 1855 received a hippo that lived for 41 years, 7 months and 29 days. Pete's health and appetite are excellent and there seems to be no reason why he should not live to establish a new world's record.

The animal — our only hippopotamus, incidentally, in the whole history of the Zoological Park — was the seventh offspring of the famous "Mrs. Murphy," a hippopotamus in the Central Park menagerie. His father was "Calif," and the Central Park pair provided most of the hippos in American zoos in the past half-century. Pete was born on July 13, 1903, and came to the Bronx Zoo on July 14, 1906, the gift of the late Samuel Thorne. He cost $3,000, and was considered a bargain — as, indeed, he was. Few animal investments have paid such continuous dividends of interest and enjoyment.

WHITE-NECKED CRANE CHICK

Twenty years ago a pair of White-necked Cranes from Asia hatched an egg in the Zoological Park. That was the only record of successful breeding in the United States until this spring when our present pair laid an egg on May 17 and hatched it 32 days later, on June 20. The chick is strong and healthy, and may be seen in the Blackbuck Paddock.

While the cranes were sitting, two Barnacle Goose eggs were deposited in their nest by a Barnacle that has the run of the same paddock. Both eggs hatched — one under the cranes and the other under a mated Hutchins and Pink-footed Goose pair to which the second egg was given. The goslings are doing well, too.

PUBLICATIONS OF INTEREST

PICTURE BOOK OF INSECTS. By ALBRO T. GAUL. Lothrop, Lee & Shepard Co., New York, 1943. 40 pp., 42 illus., $1.50.

Picture Book of Insects will familiarize children in a general way with the field of insects. Mr. Gaul has selected some examples typical of those insects that a child is apt to see while walking through a city park or in the country. He has given a short account of the more interesting features of the insects' habits together with an identifying photograph.

"What is the difference between an insect and a bug? How does an insect grow?" These and other likely questions are answered in a lucid style entirely within the comprehension of a seven-year-old child.

Each insect, as the title implies, is illustrated by a large photograph. The pictures contain an excellent amount of detail and the child should have no difficulty in identifying the group to which his specimen belongs. A life-size silhouette has also been included as an aid.

This book is a particularly happy choice for it is so arranged that it will interest the child and stimulate him to further investigation of the subject as he grows older.— *Henry Fleming.*

THE AMERICAN BISON

by

MARTIN S. GARRETSON

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for accounts of it, pictures its wide range and incredible numbers. This is the story of exploitation, near-extermination, and the rise of a strong national sentiment that saved the species.

254 pages, 65 illustrations *$1.50*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

PRESENT DAY MAMMALS

by

CLAUDE W. LEISTER

Students in Zoology and Biology classes, as well as the general reader who has often been puzzled by the relationship of mammal groups, will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. Typical representatives of every Order of mammals are pictured, and there is a clear text explaining the zoological status of the animals.

74 pages, 106 illustrations *50 cents*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

TROPICAL WILD LIFE IN BRITISH GUIANA

by

WILLIAM BEEBE, G. INNESS
HARTLEY & PAUL G. HOWES

Under the prosaic subtitle of "Zoological Contributions from the Tropical Research Station" Dr. Beebe and his associates produced a fascinating survey of subhuman life in a tropical jungle—mammals, birds, reptiles, insects, fish. Here are elaborate notes on the curious Hoatzins, descriptions of a tropical expedition at work, scores of magnificent jungle pictures. An early book by Dr. Beebe, but one packed with interest.

504 pages, 143 illustrations *$1.50*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

SERPENTS of the NORTHEASTERN STATES

by

RAYMOND L. DITMARS

There are many books on the identification of our local snakes, but this is still the simplest and in many ways the most practical for the layman who wants to know enough about snakes at least to keep out of their way! It tells what snakes are found in the Northeastern States, where they are most likely to be found, what to do if you are bitten by a poisonous snake, what they look like. Photographs of every species in this area.

60 pages, 41 illustrations *50 cents*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

NEW YORK ZOOLOGICAL SOCIETY
FOUNDED

XLVI • No. 5 SEPTEMBER–OCTOBER 1943

90.673
959

Mus

ANIMAL KINGDOM

SMITHSONIAN INSTITUTION
OCT 7 - 1943

BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

H BABIES AND THEIR NIGHT LIFE, *by Donald Marcy* • DR. BEEBE TAKES A LOOK AT
FORMER INHABITANTS • PORTRAITS OF PRIMATES • NOTES FROM THE ZOO

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field
De Forest Grant
Warren Kinney
William De Forest Manice
David H. McAlpin
Robert Moses
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Eugene Holman
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert I. Gannon
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
Kermit Roosevelt
John M. Schiff
Frederic C. Walcott

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van	*Executive Secretary*
Jean Delacour	*Technical Adviser*
William Bridges	*Editor & Curator, Publications*
Sanford Miles	*Comptroller*
Claude W. Leister	*Curator, Education*
Donald Marcy	*Associate, Education*
Millward W. Heath	*Supt., Construction & Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall	*General Curator & Curator of Birds*
Claude W. Leister	*Associate, Mammals*
John Tee-Van	*Associate, Reptiles*
Leonard J. Goss	*Veterinarian*
Harry C. Raven	*Associate, Anatomy*
Grace Davall	*Assistant to General Curator*
W. Reid Blair	*Director Emeritus*
William Beebe	*Honorary Curator, Birds*

AQUARIUM

Charles M. Breder, Jr.	*Director*
Christopher W. Coates	*Aquarist*
Ross F. Nigrelli	*Pathologist*
Myron Gordon	*Research Associate in Genetics*
George M. Smith	*Research Associate in Pathology*
Homer W. Smith	*Research Associate in Physiology*
Charles H. Townsend	*Director Emeritus*

DEPARTMENT OF TROPICAL RESEARCH
William Beebe, *Director*

Jocelyn Crane	*Research Zoologist*
Henry Fleming	*Entomologist*
George Swanson	*Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

VOL. XLVI OCTOBER 1, 1943 No. 5

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

Reversing the Order

While a Zoo is a place where people come to look at the animals, there exists, in every properly-run Zoo, a small group whose function it is, among other things, to look at the *people*. In other words, we members of the administrative organization who are doing everything we can to run our Zoological Park in bang-up fashion, know that we cannot accomplish this unless we constantly watch public reactions to discover what type of exhibits and what methods of exhibition technique have the most appeal and hold the most interest for our visitors. In effect we are conducting a friendly form of counter-espionage. We keep on learning new things and as long as we play this game actively ourselves, keeping our eyes wide open, we know we will be able to make a steady improvement in the great Zoological Park which is under our care.

One word as to the visitors of the year 1943 – already totalling some one and one-half million persons in number. It seems to us that it is the most lively, most interested, most, shall we say, "heads up" crowd that we have observed. We cannot tell just why we gain this impression. Perhaps it is that during this war period people have found a peculiar and extraordinary enjoyment in observing and studying the noble, curious and colorful living forms, each of which has its own place in the vast and inspiring scheme of Nature.

Fairfield Osborn

IN THIS ISSUE

Portrait of Old Nellie . . . . *Sam Dunton* COVER
Night Life of the Bush Baby . . . . *Donald Marcy* 99
Quetzals *Do* Breed in Captivity . . . . *Charles Cordier* 104
Portraits of Four Primates. IV. 107
Our Zoo's Former Inhabitants . . . . *William Beebe* 111
Behind the Scenes: News and Notes 119

SHOP TALK

Ever since the last issue of ANIMAL KINGDOM *we have been pawing feverishly through the mail each morning, sure that this time somebody was going to write in and offer us the dinnerbell we have been trying to get for the Farm-in-the-Zoo.*

Just when we were beginning to think nobody cared, three dinnerbells materialized. One was brass, 4 inches across the mouth, and has a handle. We scorned it, politely but definitely.

The second dinnerbell was regulation size, all right, but its owner wanted $35 for it.

But the third bell! It's a beauty! Eighteen inches in diameter, with all the trimmings for hanging from a pole, and a voice that sounds like a hybrid between the Bare-throated Bellbird and the Abyssinian Wild Ass. It came all the way from the heart of Illinois, prepaid, with the compliments of Member Mary VanderPyl.

* * *

Two months ago President Osborn mentioned the new sound system being set up in the Zoo so we can give brief recorded talks about the animals. But he didn't tell about the shock the Education Department got the first time it tried out its Sea Lion record.

Waiting until about twenty persons had gathered to watch the Sea Lions, Dr. Leister put on his record and hurried out to hear the comments of the visitors. They seemed to be paying more attention to the animals than to the talk – and in the very middle of it they turned and walked away!

While he was pondering this complete failure of his efforts, the group of visitors broke into a flurry of finger movements.

They were all deaf mutes!

* * *

Our cover picture is Old Nellie, the Griffon Vulture, now 41 years in the Zoo. That's faithfulness for you!
—EDITOR.

OCT 7 '43

The tiny bush baby weighs only five and a half ounces and its long, fluffy tail balances it so perfectly that it seems as effortless as a piece of thistledown as it leaps six or eight feet from the floor of its cage to a perch.

Night Life of the Bush Baby

The Tiny Senegal Galago Becomes Active When the Sun Goes Down and Its Adaptation to Darkness Is Amazing

DONALD MARCY

On the opposite page is a photograph of that tiny twig from the lemur branch of the primate tree, the galago or bush baby. Many readers will be surprised to learn that bush babies have been on exhibition in our Small Mammal House almost continuously for the past fourteen years, for their small size and nocturnal habits cause them to be passed unnoticed by most visitors; but those who are fortunate enough to have seen the little animals in action are astonished by their agility and enchanted by their appealing mannerisms.[1] Luckily there are ways to lure a bush baby out of its sleeping-box in daylight – we'll talk about that later!

One evening not long ago I decided to pay a visit to our galago. Arriving at the Small Mammal House as twilight was descending over the Zoo, I stationed myself immediately in front of its compartment and began my vigil. A furry ball in the sleeping-box, which is hung half-way up a tree near the center of the cage, showed that the little animal was still sound asleep, oblivious to the vague scratchings and rustlings issuing from nearby cages and to the occasional weird vocal concerts of the coyotes and foxes.

Presently there was a slight movement in the cage; the bush baby raised its head to look intently at me with great, unblinking eyes. Still staring and uttering a questioning, birdlike chirp, the little animal hopped to the door of the sleeping-box, paused while it surveyed me with its head swiveling, then jumped to the cage floor as lightly as a piece of down and ran forward on its hind legs. Satisfied that the intentions of its visiting relative were honorable, the bush baby accepted a moth from my fingers, ate it with evident satisfaction, and stretched in a manner which struck me as being not only unique but highly amusing as well. Standing on a small branch and grasping it tightly with its right hand and left foot, the *left* arm and *right* leg were stretched to their fullest extent–whereupon the process was repeated in reverse!

After yawning widely and grooming itself thoroughly, the tiny creature began leaping about the cage with amazing grace and agility – from the floor to the under side of the cage top six feet above, to the floor again, to the branches of the tree, then to the wire mesh side of the cage, and finally to the tray of food on the floor. The bush baby lapped a little milk with its long tongue, swallowed a few bites of fruit, and the aerial acrobatics began once more.

Though smaller than a chipmunk and weighing only five and one-half ounces, jumps of six or eight feet are matter of course for the little animal, even in the restricted space of its cage, and galagos have been seen to jump twenty feet diagonally downward. I tried to imagine a bush baby fleeing through the trees of its dark and lofty African home with a hungry owl in pursuit – the jumps must be prodigious indeed, with its life at stake!

I noticed that the bush baby quickly calculated the distance and direction to a new perch before leaping, and even when a backward or diagonal jump was involved could turn in full flight so as to land on all fours facing its goal. Clinging to the cage front, head upward and back to the tree, the bush baby would launch itself backward and twist in midair, alighting on a branch in a horizontal position facing the back of the cage – having turned through 180 degrees on the horizontal axis and 90 degrees on the vertical axis!

---

[1] Since this article was prepared, the two specimens of the galago in our collection have both died — so it will not be possible for our Members to see the bush babies in action. However, Mr. Dunton's photographs are so interesting we hope they will be acceptable as a substitute.

Wishing to determine whether the nest-building habit of wild galagos would show itself in our specimen, I tore strips of paper from my notebook and thrust them into the cage. Sure enough, the strips were immediately picked up one at a time in its hands and transferred to its mouth. With quick hops the galago carried the fluttering strips to the sleeping-box, placed them in a corner, and fashioned the paper into a rough nest by bending and crumpling it dextrously with hands and mouth.

Darkness now forced my observations to cease for the time being, and as I prepared to leave I could faintly see the bush baby still jumping about with swiftness and precision – perfectly at home in a cage so dark that the little animal appeared to be nothing but a shadow without substance floating through space between perches invisible to me.

* * *

The thirty-odd species and subspecies of the genus *Galago* are all natives of Africa and a few of its adjacent islands. Varying from the size of a mouse to that of a cat, they are externally distinguishable from other lemuroids, some of which they closely resemble, by their large, almost naked ears. Our species, *Galago senegalensis moholi,* is an attractive form abundant in central and southern Africa. It is one of the smaller species, the head and body being only six and one-half inches long and the tail about two inches longer. Beautifully colored, the dense, fine fur is brownish-gray above and lighter below, the outer sides of the legs cream buff, and the cheeks and bridge of the nose light gray.

The enormous, bulging eyes are the most conspicuous feature of the rounded head. During the day the light brown iris covers most of the eye so that the pupil is a mere vertical slit, but at night the pupil is opened wide to permit a maximum of light to enter the eye. When seen at night by reflected light the eyes glow with an intense amber color, giving the impression that they belong to a much larger animal.

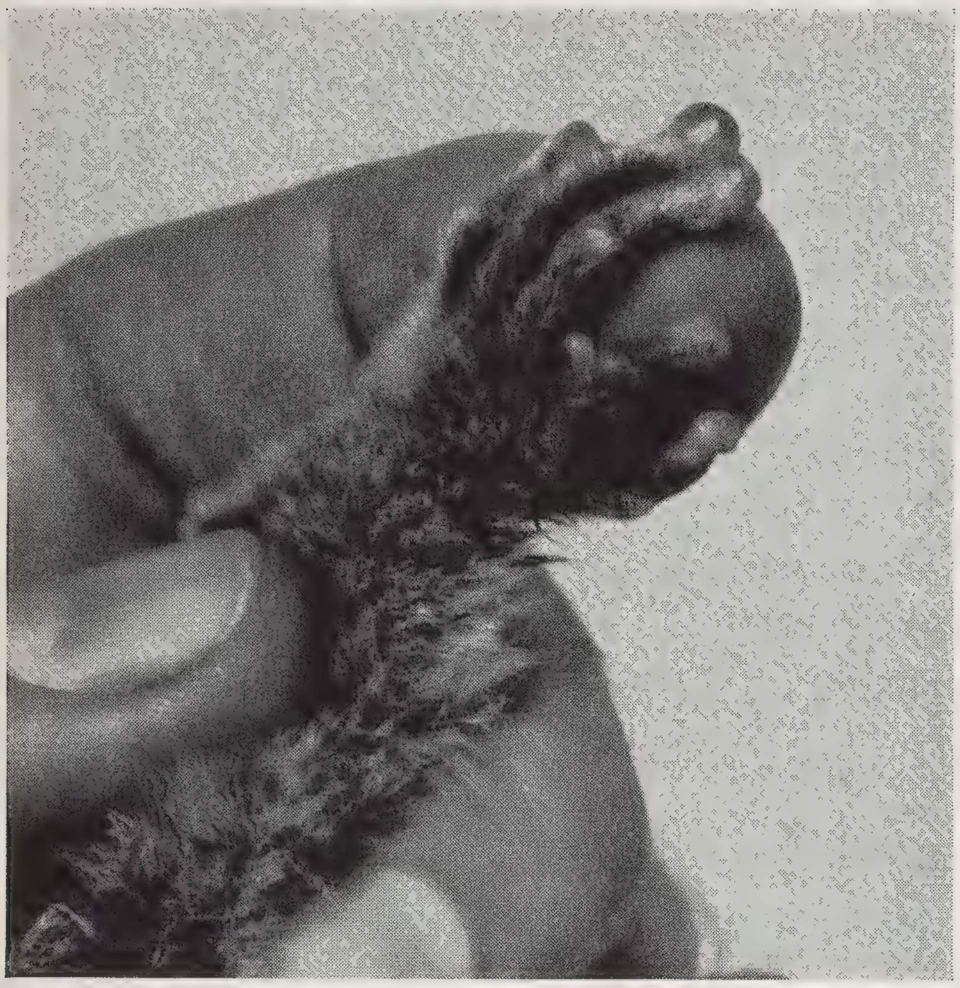
The retina of the vertebrate eye usually has two kinds of photoreceptive cells: cone cells, which are concerned with distinguishing color and light of high intensity, and rod cells, which perceive differences in light and dark and are highly sensitive to light of low intensity. The latter also perceive objects in motion. It is significant that the retina of the bush baby's eye *has rods but no cones.* The cornea – the transparent window at the front of the eye – is very large, constituting one-third of the entire eyeball, and the lens is likewise of great size. Knowing the structure of the bush baby's eye, we can understand the reason for its keen vision at night, and, recalling how our own eyes hurt when we emerge from a dark theater into sunlight, we can appreciate its avoidance of the bright light of day.

So large are the galago's eyes that they cannot be turned in their sockets by the eye muscles. The extreme mobility of the head itself compensates for this condition, however, and it does not appear to be a handicap. A galago constantly turns its head this way and that, twisting it around until the nose is directly over the midline of the back or swiveling it so far that one eye is directly above the other – or farther!

The large, membranous ears are constantly turning in various directions in response to the faintest sounds. An interesting peculiarity of the ears is that they may be pulled back flat against the head in alternate ridges and folds, probably as a means of protecting them from injury as the animal passes through dense foliage or through a small aperture. They are sometimes folded when a bush baby sleeps, and are said to be pulled back when it is fighting.

Although the muzzle is short and the nose small and pointed, the olfactory sense is well developed in the galago; unlike the monkey, it relies upon its nose rather than upon its hands for examining strange objects. This as well as the complete lack of facial expression emphasizes the fact that the bush babies are much nearer to the roots of the primate tree than the monkeys and apes.

As with all primates, including man, the bone structure of the forearm permits pronation and supination – that is, the hand may be rotated



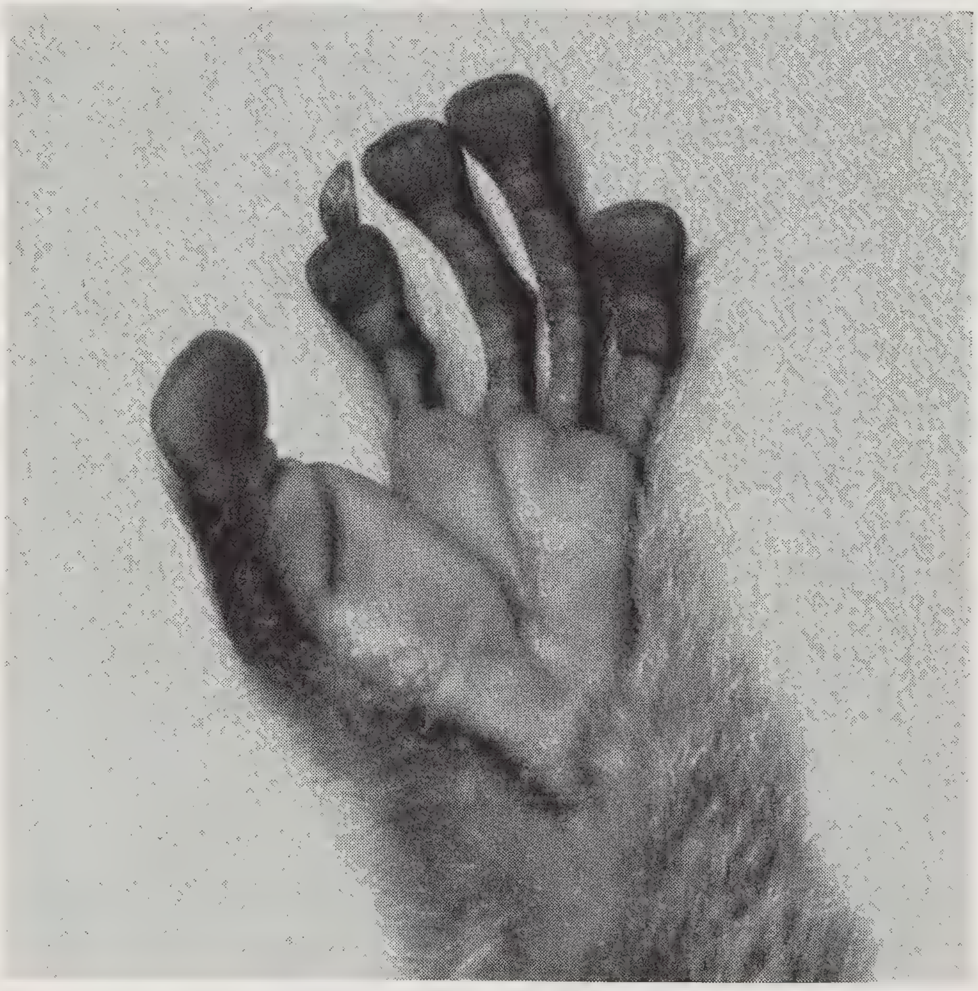
The bush baby's hand has flat fingernails and almost bulbous fingertips. The friction pads on the palm, that aid in climbing, can be seen between two fingers.

freely. This is a condition that arboreal animals find particularly useful. The sturdy collar-bone, attached at one end to the breast-bone and at the other to the shoulder-blade, helps to give a solid foundation for the action of the forelimb — another characteristic common to climbing animals.

A bush baby's fingers are long and slender, the fourth being longest, and all have flat nails. The thumb is thicker than the other fingers and is opposable to them, although the index finger sometimes separates with the thumb and sometimes with the other fingers when a small branch is grasped. The tips of the fingers are expanded into friction discs which, with the pads on the palms, help to make the hand a most effective clinging device. The bush baby is the only animal known to increase the adhesive power of the hand and foot pads by moistening them with urine. Thus it is capable of clinging to smooth surfaces and can even climb up the edge of a pane of glass by grasping it between thumb and fingers and the "big toe" and its opposing digits.

Objects are grasped in the fingers without involving the palm of the hand or the thumb; the two outer segments of each finger are flexed while the proximal segments (next to the palm) remain in line with the palm. Hence the object is pressed between the two outer segments and the inner segments of the fingers. Picking up a pencil in your own fingers will make this easy to understand.

From the hind legs, which are twice as long as the forelegs and about an inch longer than the body itself, comes the power for the bush baby's spectacular leaps. The extreme length of the legs is obvious even in a sitting position when they are flexed with the knees high and far forward — so far forward, in fact, that they sometimes overlap the backwardly-projecting elbows. Much of the length of the leg comes from the foot, which has an overall length of more than two inches due to the elongation of two of the bones of the ankle, the calcaneum or heel-bone and the navicular, which lies above and slightly ahead of it. The great strength of the leg muscles and the elongation of the ankle results in a very powerful and efficient "throwing stick," capable of flinging the light-weight body over long distances with ease.



On the underside of the galago's foot the heavy pads on the palm and on the toes are quite visible. The claw on the second toe is used for grooming the soft fur.

Widely separated from the four remaining toes, the hallux or "big toe" is sturdy and strong. The soles of the feet and the tips of the toes bear large friction pads, and all toes have flat nails except the second which is equipped with a claw, an efficient scratching tool used in grooming.

Probably the soft and fluffy nature of the fur helps to buoy up the light-weight body and decrease the impact of the landing after long jumps, and the long, bushy tail is an important aid to balancing when the animal is perching, running, or jumping. A sleeping galago usually curls its tail around its feet and under the chin, and sometimes uses it to shield the eyes from light.

Although the bush baby ordinarily progresses in a series of jumps — spectacular when in a hurry — it frequently runs or walks on all fours along branches or on flat surfaces, and is also able to hop like a kangaroo on its hind legs or run upright on them for short distances, manlike.

In their natural habitat galagos spend the day sleeping in nests which they build of soft materials in hollow trees and other dark places. Often several are found snuggled close together in the same nest, and it is said they sometimes sleep continuously for several weeks during periods of drought when food is scarce. During the night they forage about in trees for fruit, insects, small birds and their eggs. Live prey is caught in the hands and transferred to the mouth, but fruit and similar food is first smelled, then picked up directly in the mouth. They are also said to eat gum arabic, produced by acacia trees, and from this habit they are sometimes called "gum animals."

In the Zoo our bush baby is fed apples, oranges and other fruit, as well as hamburger, insects and eggnog. Our bush baby seldom touches its food during the day, but apparently its love of insects is strong enough to overcome its abhorrence of light, for it may be lured out of its sleeping-box in daylight with a grasshopper or moth as bait. The animal may be awakened by tapping on the cage front, and the insect should be held up so that it may be seen. Usually the bait will be immediately grasped and eaten.

According to one story, which is repeated with misgivings, galagos may acquire a taste for alcoholic beverages if given the opportunity. It seems that a certain planter was disturbed at night by the loud, piercing cries of the little animals feeding in nearby trees. Unable to sleep, the exasperated fellow hurled a mug of ale on them. Quiet ensued while the bush babies carefully lapped the liquid from their fur, and apparently they spent the balance of the night in deep slumber. The next night, however, the din began once more, but seemed to come from twice as many throats. Finding that the same treatment was again effective, the planter always placed a bowl of ale under the trees and presumably slept soundly thereafter! So far, we know of no primatologist who has studied the effects of habitual drunkenness on the family life of the bush baby.

Tall as this story may seem, it is said that bush babies are sometimes captured by inducing intoxication with palm wine or fermented fruit juices. Their normal instinct to flee is inhibited and they would just as soon be caught as not.

The teeth of the bush baby are well adapted to its omnivorous diet. Sharply pointed cusps on the cheek-teeth break up the food which has been held or sheared by the action of the upper canines and the opposing first lower premolars. The lower canines are slender and lie close to the extremely fine incisors, which lean far forward and are pressed closely together. This tooth complex is an efficient scraper for cleaning the skin and fur and bush babies seldom go long without grooming themselves and their companions both with the incisors and with the tongue, for they are cleanly animals.

High-strung and sensitive, the bush baby responds to the faintest sounds and slightest quick movements with quivering ears and swiveling head. It is easily startled and its first reaction to any unexpected sound or movement is a quick hop away from the disturbance. Nevertheless the animal is exceedingly courageous, and while it will attack only on extreme provocation, it does not hesitate to leap upon and painfully bite the hand which, in its opinion, is becoming too familiar! The truth of this statement will be attested both by Zoo Photographer Sam Dunton, who made the accompanying photographs, and by myself, who assisted him.

The relations of galagos with one another are ordinarily most friendly, and apparently they seldom fight among themselves. At night, when it is most active, our bush baby appears to be much less nervous and high-strung than during the day and is monkey-like in its curiosity about strange objects.

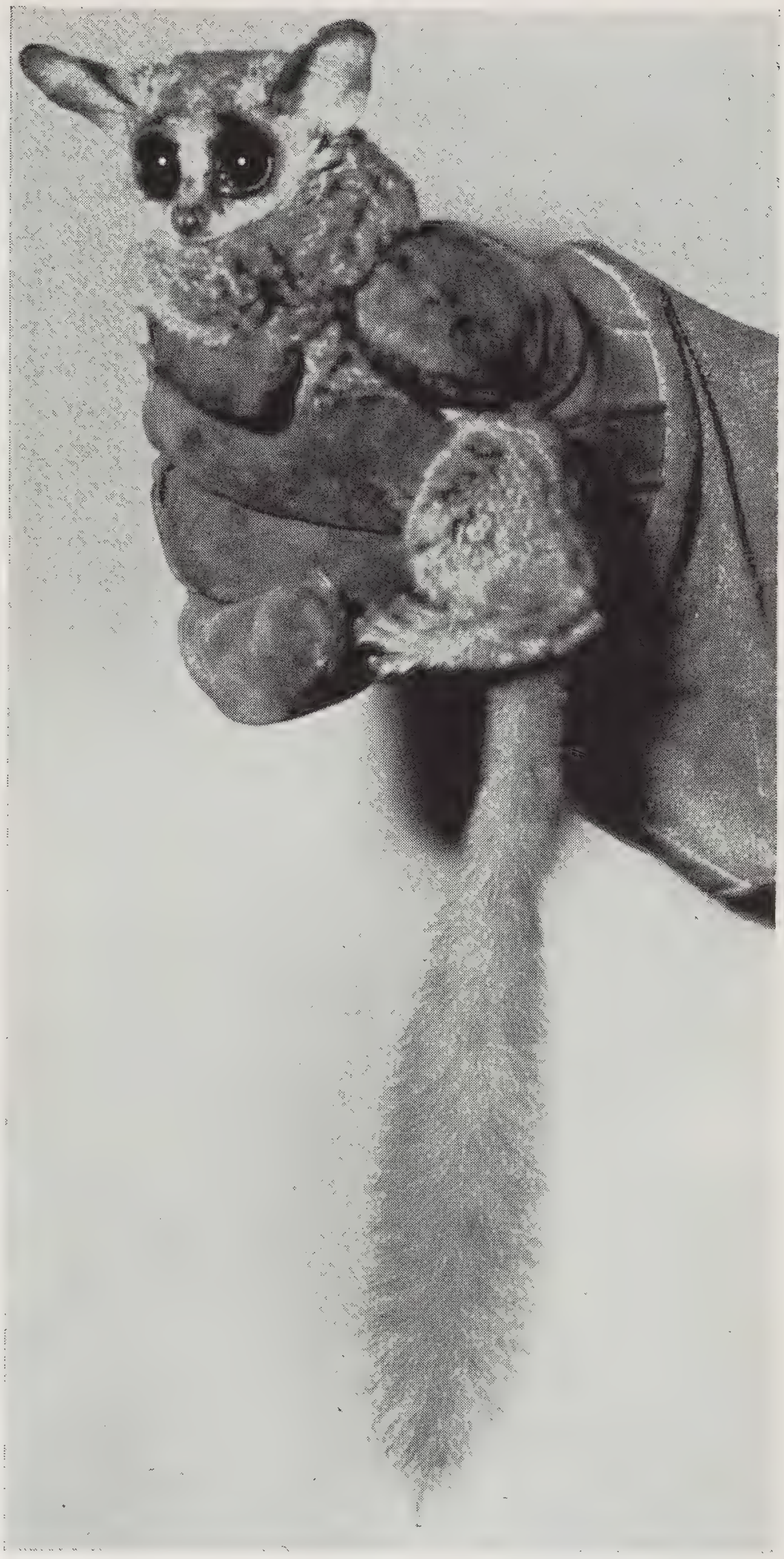
Bush babies express their emotions by movements of the ears and head and by several different vocal sounds. Most of the time ours is silent, although it utters a soft chirping note when offered a choice tidbit of food, and when excited gives a shrill chattering note. Extreme anger is expressed by a series of peculiar cough-snorts – impossible to describe, but sounding more than anything else like the noise emitted by an outboard motor which refuses to start because the gasoline tank is empty. Those who have heard bush babies in the jungle say that their voices are sometimes extremely loud and piercing and completely out of proportion to their small size.

Dr. Lowther has made a thorough study of a pair of bush babies and has described in detail the birth and development of their twins.[2] Born after a gestation period of four months, the young bush babies were about three inches long and were able to cling to surfaces or stand on all fours soon after birth. Although they clung to their mother when they were feeding, they never did so when she was moving about; when she wished to move them, she picked them up with her teeth and carried them one at a time.

At first the baby galagos spent much time in their nest. Within two weeks they were perceptibly larger and could walk about and even make little jumps of a few inches. Their development was rapid; at two months of age they were able to eat solid food along with their milk and had become quite sure of themselves in climbing and leaping. At the end of three months they stopped nursing and began capturing and eating moths.

From the first the mother took good care of her young, protesting when Dr. Lowther removed them from the nest for examination, and smelling and licking them when they were returned. The father also showed great solicitude for the babies.

So far, none of the bush babies which the Zoo has kept in the past have produced offspring; perhaps their quarters in the old Small Mammal House have not been entirely to their liking. Post-war plans include a new and improved building for small mammals, and when we secure a pair of bush babies they may find conditions suitable for rearing a family – let us hope so! At any rate, it is pleasing to imagine a family group of the tiny creatures hopping actively about a neat, spacious compartment illuminated during visiting hours by dim blue lamps, and taking their rest in artificial sunlight at night – when they would otherwise be wide awake.



This gives some idea of the size of the bush baby – it fits comfortably into the hand. It would bite that hand, too, if it weren't for the leather glove.

If Mother Nature, through her devious methods, decided to develop a new and perhaps better man-type, she would certainly pass over the bush baby as possible ancestral stock. "Sorry," she might say, "but you are already overspecialized, and I'll have to start with something much simpler than you!" *Were* the bush baby to evolve into a new form, it would probably have bigger eyes and ears, longer legs and ankles and – who knows – might be the champion jumper of all time!

---

[2] F. De L. Lowther, *Zoologica,* Vol. XXV, Part 4, Nos. 25-34, 1940.

Quetzals *Do* Breed in Captivity

The Zoological Society's Collector Brought Back from Costa Rica a Record of the Nesting of These Rare Birds

CHARLES CORDIER

[When Charles Cordier, the Zoological Society's collector of South American birds, returned from Costa Rica almost a year ago, he reported that he had copied the nesting records of a pair of Quetzals in the possession of Señora Amparo Zeledon. Since information about the nesting of these birds is almost non-existent, he consented to prepare an article on the matter for publication in Zoologica, the Society's technical journal. This has now been published, and the story is so interesting that it is reprinted here. Following Mr. Cordier's directions, a nesting log was set up where our Quetzals have access to it, but to date they have shown no interest in it as a possible nesting site. — Editor.]

In March, 1942, I had the good fortune to meet in San José, Costa Rica, Señora Amparo Zeledon, widow of the well-known ornithologist who died a few years ago.

At that time I was starting on a collecting trip having as its objective the capture of the Bare-necked Umbrella Bird (*Cephalopterus ornatus glabricollis*) and other rare birds for the New York Zoological Society.

It was with considerable elation that I noticed at Señora Zeledon's home a large, well-planted aviary, approximately 30x15x10 feet, in which was a pair of Costa Rican Quetzals, *Pharomachrus mocinno costaricensis,* in superb condition. The male trailed behind in its flight a pair of upper tail coverts nearly a yard long. Subsequently I was able to purchase this pair and the birds are now on exhibition in the New York Zoological Park, together with several other Quetzals.

The most interesting part of my discovery was that Señora Zeledon told me that the Quetzals had reared young successfully on two occasions and that she had made notes of these events at the time. She was kind enough to lend me her notes, which I have translated and reproduce herewith:

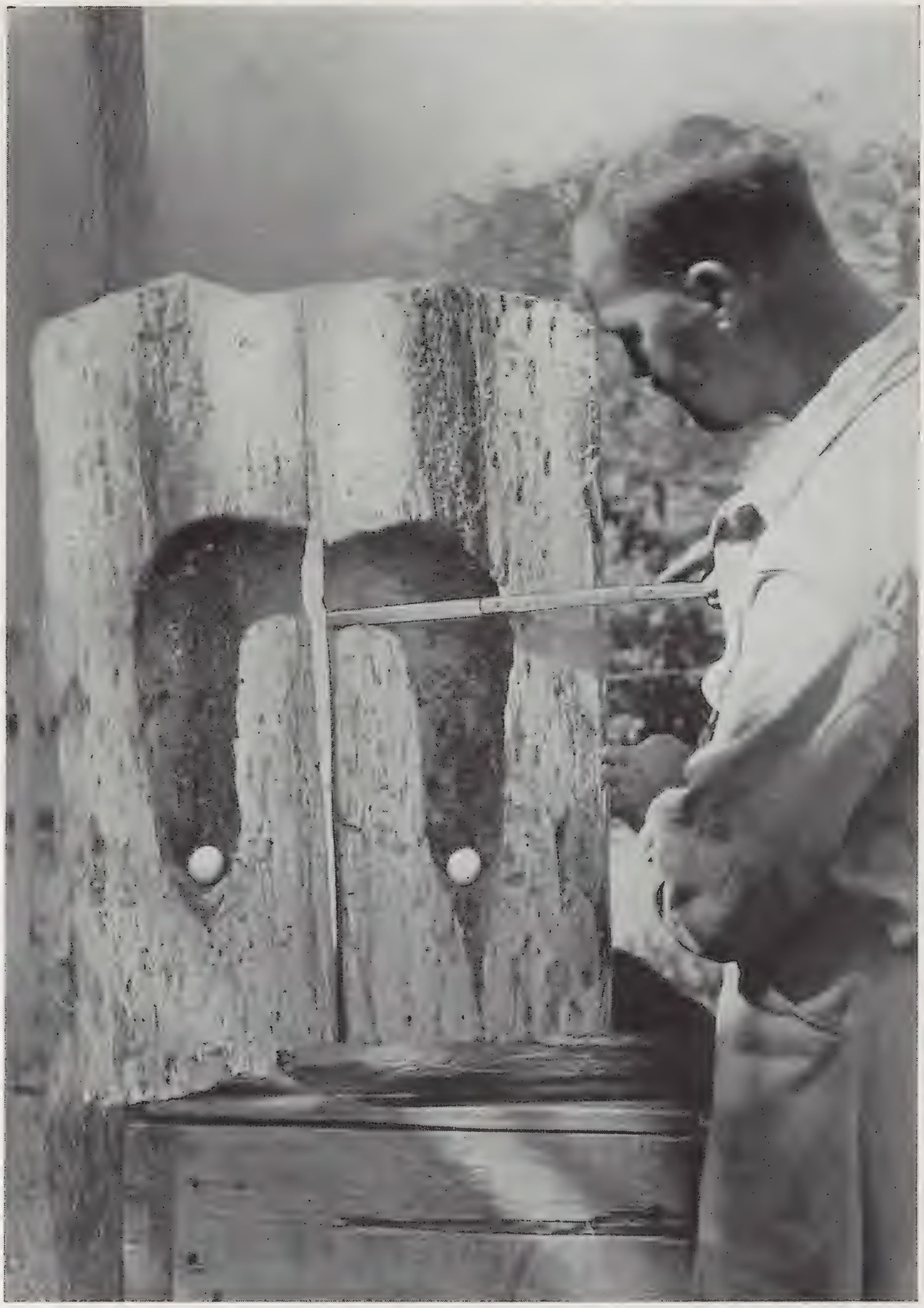
"We noticed the young bird peeping through the entrance hole on August 8, 1940, and on the 12th it left the nest.

"Both male and female were feeding it as long as it was confined to the nest, but once outside, only the mother cared for it, feeding it earthworms [Of all things! — Translator] in the morning, and fruit [By which is meant cut-up little plantains known locally as "guinea"—Translator]. On the 16th of the same month it fed itself for the first time. I suppose the birds started nesting at the end of June.

"The tree trunk in which they nested had been in the aviary for more than two years, exposed to the weather, before they showed any interest in it, the male preferring to enter a bigger, irregularly-shaped hole in the wall forming one side of the aviary. The female, however, would only reluctantly go near it, the entrance hole probably being too wide. Fortunately they decided on nesting in the tree trunk after two long years, the wood having become soft enough to be worked on by them.

"The male moulted at the end of August and lost its long tail coverts at the end of September.

"The plumage of the young bird at the moment it left the nest was uniform coffee-color, except the wing coverts which were green.



Although this is the nest of the Honduran form of the Quetzal, it is typical of that of the Costa Rican bird we hope will breed in the Zoological Park. Dr. V. Wolfgang von Hagen, who brought out the first live Quetzals in 1937, cut this nest apart to show that, contrary to legend, the nest has only one hole.

Photo Copyrighted
by V. W. von Hagen

"Both parents had been kept for three years in the big aviary and previously for two years in a much smaller aviary in which they would get very wild as soon as approached. In the big enclosure they are quite steady and take no notice of visitors. The pair was composed of a young male and an adult female purchased from the natives.

"February, 1941: The male, already in good plumage, started to enter the nest in the middle of February and to clean it out, carrying loads of dust in his breast feathers which he would shake out, once outside. Both started uttering their calls and the female entered the nest some days later, mornings and afternoons. Both adults started chasing the young Quetzal from the vicinity of the nest and stayed continuously near it, even in March.

"On March 31, 1941, I noticed the female coming out of the nest to let the male get in. Shortly afterward the male came out and the female re-entered.

"April 19: Today I had the gardener trim the trees in the aviary and he noticed two young birds in the nest, maybe 8 days old.

"Five days later we found a dead young Quetzal on the ground. One side showed signs of having been injured. Possibly the birds got frightened when the gardener worked in the aviary and threw one of the nestlings out.

"The young Quetzal, reared the previous nesting season, is still being relentlessly persecuted by its parents. On Friday, May 2, they bit it almost to death. I took it out, did my best to cure it, but found it dead the following day. I had made the mistake of putting it back in the aviary. Even when it was lying dead on the ground, the female would swoop furiously down on it.

"On May 12, 1941, this season's young Quetzal could be seen at the nest hole. It left the nest on May 18, early in the morning. Male and female re-entered the empty nest several times that day."

On discussing the birds' performance, Señora Zeledon said she believed she knew why the Quetzals waited two years before nesting. She thought the wood in the tree trunk was too hard and they could not work it and shape it to their liking. In 1942 she had the old tree trunk replaced but no attempt at breeding was made, the wood probably again being too hard.

I measured the old trunk and found it to have a diameter of about 12 to 13 inches. The nesting hollow was approximately 9 inches in diameter. At the bottom was a shallow cup hollowed out, leaving a rim all around of a width of about 2 inches. The lower rim of the entrance hole, almost 5 inches in diameter, was about 6 inches from the rim of the cup.

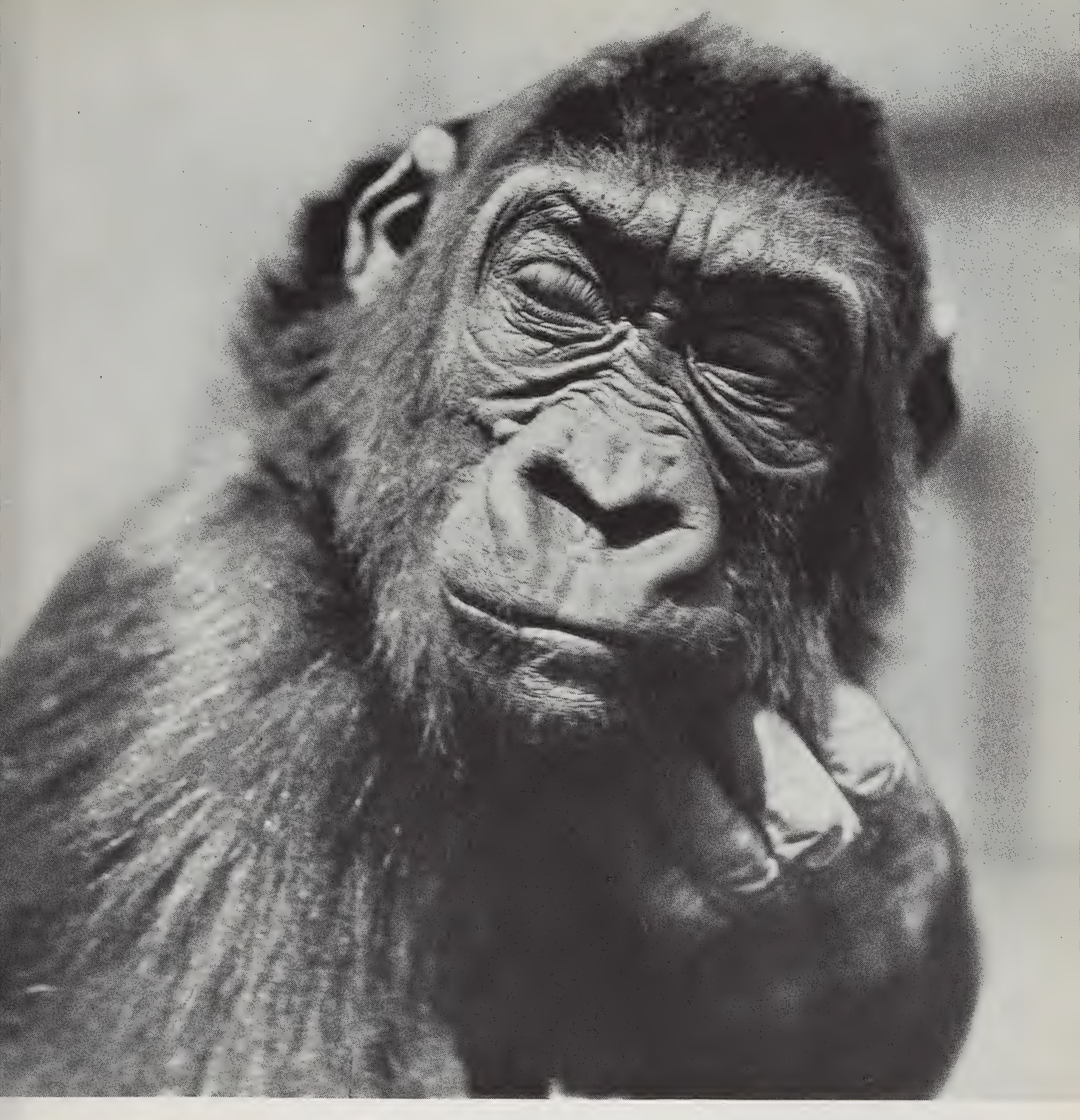
Any future attempt at breeding should take into consideration the condition of the log, which should be so well rotted throughout that bits can be pried off with the fingernail, and should have an entrance hole and nesting cavity smaller than the measurements given above. The birds will accommodate it to their liking themselves. It would also be a good plan to wet the log thoroughly from the outside, with a hose, daily, to reproduce natural conditions.

Quetzals breed in cloud forests which are dripping wet almost the year around. While in Costa Rica I found two nests at an altitude of 4,000 feet. One was located deep in the cloud forest in a tree stump about 15 feet tall, so rotten that it swayed when a finger was pressed against it. The diameter of the stump was at most 9 inches, which goes to show that occasionally the Quetzal takes to cramped quarters. The entrance hole was about 12 feet from the ground. I caught the male, who was brooding inside, by walking noiselessly up to the nest and covering the hole with a butterfly net on a short pole. This was in the month of June.

The second nest was situated in an enormous tree trunk, charred by fire and standing in a clearing. The entrance hole was a good 20 feet from the ground. The native who climbed up to it risked his neck by doing so. The nest was deep. He brought up two eggs, the size of pigeon's eggs, uniformly blue in color. He replaced them but the birds abandoned the site. The natives said that they invariably do this when the eggs have been touched.

At first I thought the Quetzal lives in association with the great woodpecker, whose abandoned nest he would take over and accommodate to his liking, but later I was not so sure of this. Quetzals breed up to 10,000 feet and at the higher levels the big woodpecker is not found, being replaced by a medium-sized woodpecker, so that the Quetzal would have to accommodate a much smaller nest.

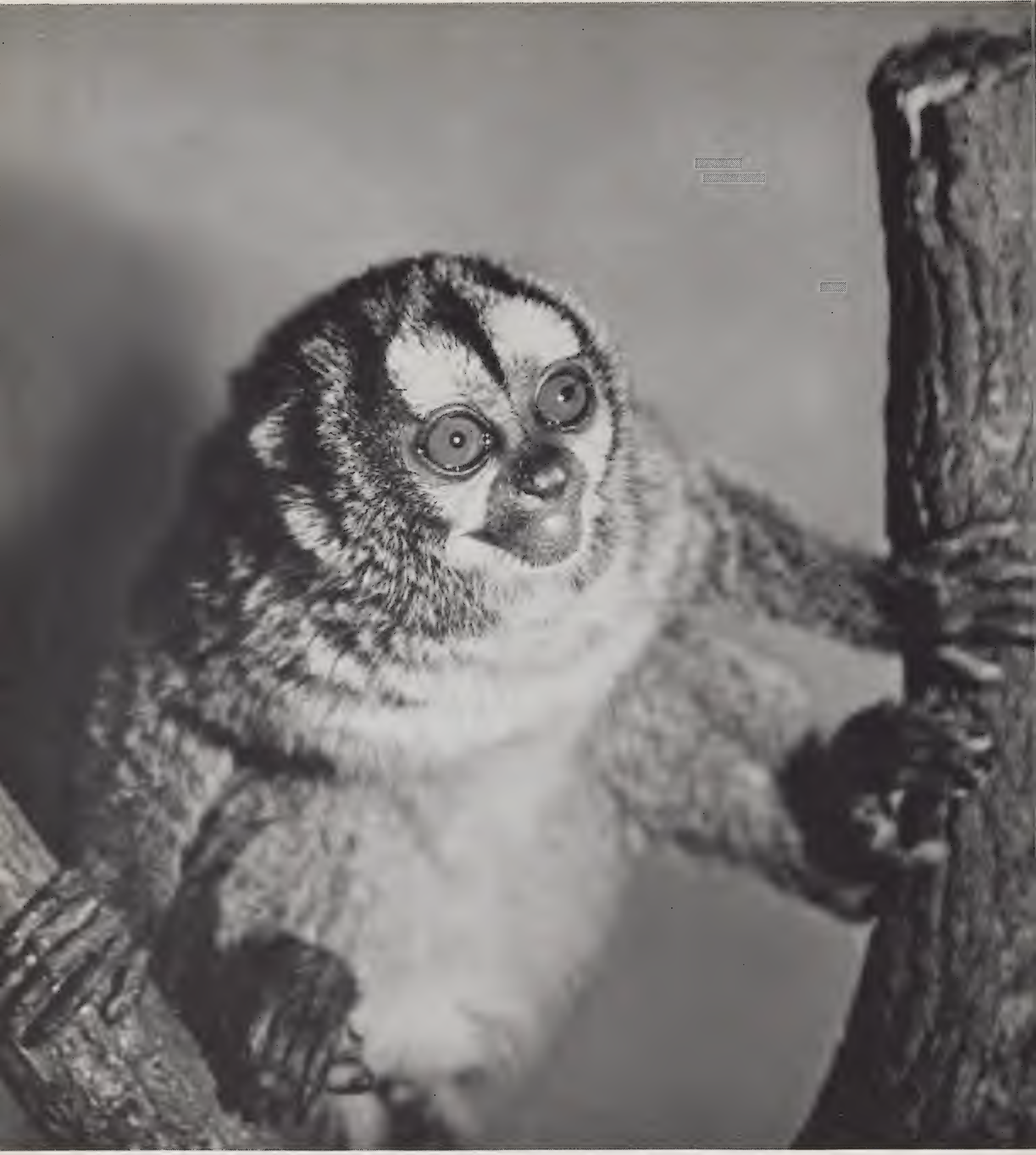
Despite the Quetzal's diminutive feet and short bill, he must be a good carpenter. I once observed in Guatemala a Red-bellied Trogon hollowing out, with feet and bill, an occupied termite nest, and these are quite hard.



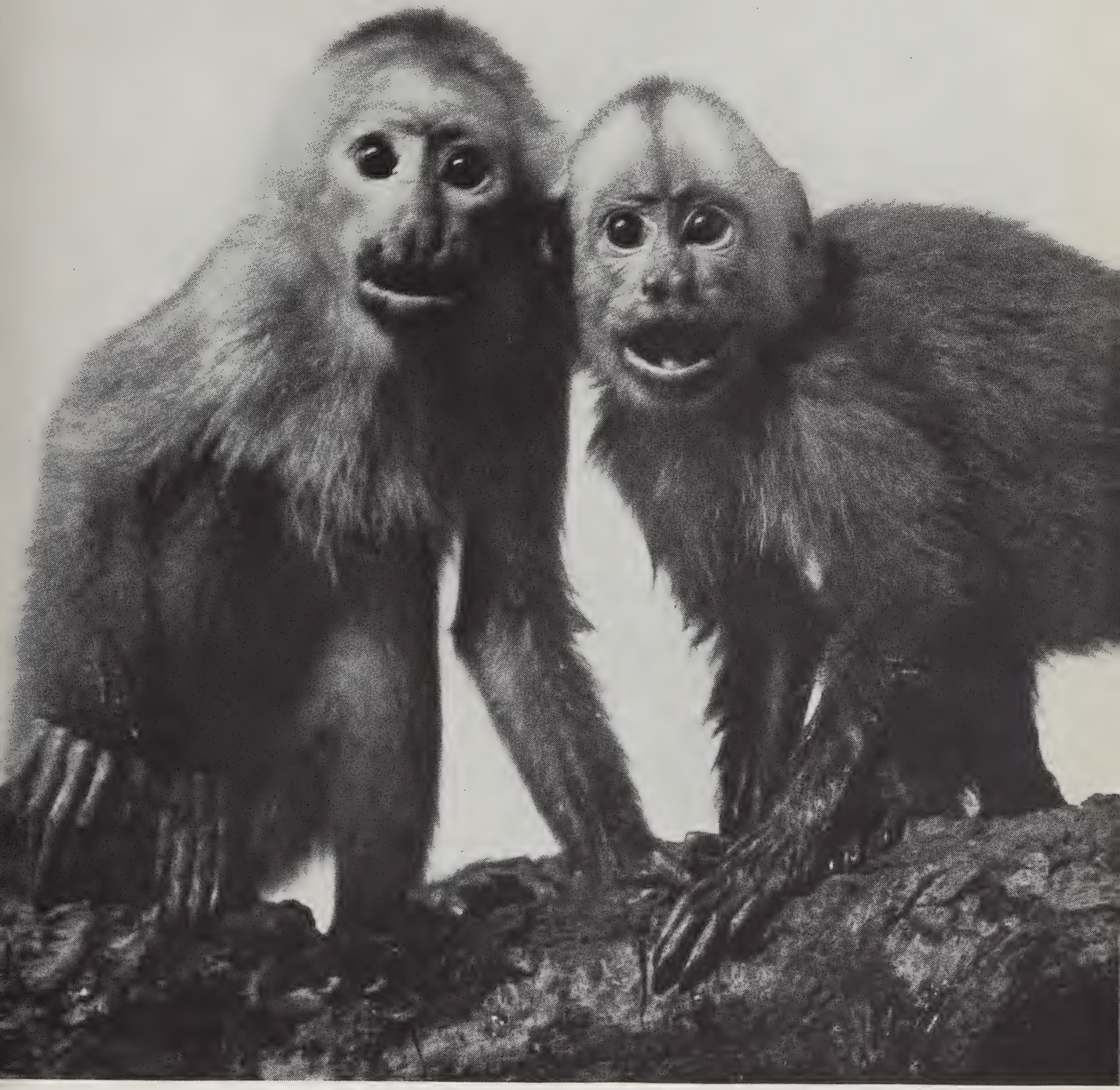
Portraits of Four Primates. IV.

Pensive moments must come to all the anthropoids as they study the human faces peering at them, and the late Janet Penserosa – for many years our only Gorilla – was seen many times to assume this thoughtful pose.

With this series of Primate Portraits, we conclude the reprinting of the portraits in the Zoological Society's publication, "Monkey Faces."



Not only in facial expression but in habits does the Owl Monkey resemble its feathered namesake. It spends most of the daytime asleep in a hollow tree, and does not really wake up until night when it comes out to hunt for insects and fruits. This little fellow's home is in South America.



Whenever a sapajou is frightened or angry about anything, he talks about it. These White-throated Sapajous apparently had never seen a camera before — and they didn't like it when they did see it. They chattered, screeched and screamed all the way through the process of having their picture taken.

As a rule Chimpanzees do not eat with forks and hold dainty napkins when they take their meals in the Zoo, but they are such excellent imitators that they can easily be trained to do so. The trouble is, the moment the keeper is not looking, the Chimpanzee is likely to put his mouth in the dish and scoop up fruit with his lips.

Our Zoo's Former Inhabitants

Four Mammals and a Bird that Were Driven from Our Grounds Long Before the Zoological Society Took Possession

WILLIAM BEEBE

We have already taken a brief and most imperfect glance[1] at our Zoo throughout a matter of two billion, fifty-one thousand, nine hundred and forty-three years, chiefly in the far distant past. A host of additional eras and beings are ready to materialize at the focusing of our curiosity and interest.

Remember, we live within a tiny speck of land, less than one one-hundred-and-twenty-thousandth of New York State. We, as the Zoological Society, have occupied this little area for only forty-four years, and we have been the means of a veritable Noah's Ark of amazing animals siphoning out of arctic and tropics, jungle and desert, out of the air, sea and land into our cages and ranges. Here they live happily, often much longer than their span of life in the wild. Even after death they continue to fulfill their destiny, either to be dissected and add to the sum of human knowledge, or to be reincarnated behind glass at the American Museum. There, through unwinking eyes, and with more permanent physiques of plaster and wire, they patiently watch generations of humans pass and repass before their cases.

Having recounted something of the far distant life of the Zoo which flapped and galloped millions of years ago, there remain the thousands of uncaged creatures, unnoticed organisms which today teem in the soil and bark, in our ponds and rivers. These will be paraded in good time. In these days, before travel becomes again easy and before the post-war spate of captive wild life sets in, it is appropriate to take renewed interest in the life around us. When the millions of our soldiers return from the ends of the earth our responsibilities will be far different. Our renewed animal collections must then be global and the information demanded by our antipodes conscious visitors will have to be encyclopedic.

I have chosen a quintet of American animals which had been driven from our Zoo before we took possession. Red Indians and our Dutch forebears knew them, killed them with arrows and blunderbusses, and served at least two of them piping hot in evening meals of the last century. Please meet them and enjoy their valedictory.

The Gray Wolf

I once heard a wolf howl at midnight in the heart of New York City. In fact night after night, almost exactly on the hour, as I wandered about the Zoological Park watching the nocturnal habits of the animals, the wolves would begin. The unholy yelpings of the coyotes instantly added their intermittent, irritating cachinnations, but through it all would arise the full-throated, terrifying, drawn-out ululations of the gray wolves. The last wild wolf known to have lived in the vicinity of New York City was killed one hundred and thirty-five years ago.

Wolves, like Indians, are one hundred percent American. Twenty to thirty million years ago, on what are now the Great Plains of Kansas and Nebraska in our middle-west, ancient lines of wolfish forms began experimenting. Some became long-tailed and slender like civet cats, others superficially resembled bears and hyaenas. Later, giant wolves appeared, as large as grizzly bears. But all these strains ran out in the course of time. Real bears and civet cats made good.

---

[1] Animal Kingdom, May, 1943, p. 50.

Finally about eight millions of years before today, there evolved an animal, which we call *Tomarctus,* which succeeded in life, and became the Nth great-grandfather of all wild dogs and wolves. Our own wolf appeared sometime in the last half million years, while side lines were still dying out. One of these was that of the dire wolves of California, who had so little sense that at least five hundred of them, one after the other, fell into and expired in glutinous asphalt lakes.

The gray wolf does not seem to have been especially dangerous to the Indians of New York and elsewhere. As long as human beings did not keep cattle and horses, the wolves were satisfied with their wild diet and let man alone. Only thirty-five years after the discovery of Manhattan by Henry Hudson, a Dutch resident of this city writes that the principal objection to keeping sheep in the colony was the number of wolves. From this time on, first Dutch and later English governments promulgated Act after Act for the destruction of these animals. One example will suffice:

About 1770 the following Order was issued: "Forasmuch as divers inhabitants of this colony have suffered many grevious losses in their stock, both of sheep and neat cattle, for the prevention of which and encouragement of those who shall destroy wolves in the said colony, and that the breed of wolves within the colony may be wholly rooted out and extinguished, be it enacted, etc., that in the County of Westchester there be paid twenty shillings for a grown wolf killed by a Christian, ten shillings for such a wolf killed by an Indian, and half that sum respectively for a whelp." In these days, the Indians would have formed a Redman's Union, and paraded up and down with birch bark placards, mottoing Unfair to Wolf Killers! Unbountyful Restrictions! The wolves more than held their own, and in 1776 the bounty was increased from thirty shillings to three pounds sterling.

The reaction of gray wolves to the advent of white men is rather complex and a direct result of their level of intelligence. When lambs and calves first appear in their hunting range, wolves find these so much easier prey than fawns and other wild creatures that they become a serious menace. They are soon thinned out by means of poison, traps and guns. Before long, however, there occurs a readjustment to these new dangers, and succeeding generations of cubs are taught to distrust anything tainted with the scent of human beings. At this point wolves begin to increase again, and only by the steady destruction of the forests and the spread of occupied land are they ultimately defeated. Among creatures of the wilderness the crow alone excells the wolf in matching its wits against those of man. If wolves were smaller, or had the power of flight, they would put up an amazingly stiff resistance.

The family life of a wolf is as perfect as in any other mammal. Wolves mate for life, share in hunting for their young, and seem to be able to equip their allotment of four to eight offspring as thoroughly mentally as they do physically. In winter, especially in isolated uninhabited regions, wolves hunt in packs, and exhibit great shrewdness in the use of their numbers to head off or tire out their prey. In general resource they are well ahead of any domestic dog.

We breed monstrosities of canines; flatten their poor faces, shorten their legs to mere stumps, give them hyperthyroid eyes, strip them naked as the dawn or embed them in such masses of hair that they can scarcely see; we can magic them to muff size or to giant boar hounds, make them permanent cowards or chronic fighters, waddlers or mile-a-minuters. Yet at the back of their sophisticated brains or what functions as such in their distorted skulls, even a Mexican hairless or a Scottie will often turn around and around before settling to sleep, to press down and smooth out the bed of leaves and sticks of some ancient, wolfish ancestor.

The Wood Bison of the Hudson

In the Palaeozoic Age of jokes there was one which was almost as ubiquitous as that of the

Mother-in-law. This was about the Englishman, who, visiting the United States for the first time, gets his rifle ready and asks to be ferried across the Hudson River to hunt bison on the New Jersey side. This serves to emphasize the unexpected truth that there was a time when, if we stood on the New York shore, furnished with a good field glass, we could have seen herds of American bison silhouetted against the sunset on the tops of the palisades.

Except for the south, the remains of bison almost box the compass around New York City; north-east, north, north-west, west and south-west; Cape Cod, Albany, Syracuse, Stroudsburg and Trenton. These were wood bison, like those living today in Canada, and their trails through the dense forests made man's journeys easier than they would otherwise have been. In 1773 the Pennsylvania bison numbered about twelve thousand, and the last one was killed in 1810 in Northumberland County. So if our Englishman's grandfather had travelled only one hundred and forty miles west of New York City he could have killed his bison.

Curiously enough, the first American bison to be seen by a Spaniard were in Montezuma's zoo in the Aztec capitol of Mexico, and the first observed by an Englishman were living wild in what was to become the capitol of the United States, in the District of Columbia. De Solis, who was with Cortez, writes: "But nothing was more surprising than the sight of the Bull of Mexico, a rare composite of several and divers animals; taking from the Camel the hump upon the shoulders; from the Lion, the flank dry and drawn up; the tail tufted, and the neck furnished with a long fringe in the manner of a mane; and from the Bull, the horns and the feet cloven. Outside of which, it imitates the ferocity of the last, in the vigour and the lightness with which it attacks."

Sir Samuel Argoll, in 1612 at the head of navigation of the Potomac, found "great stores of Cattle as big as Kine, of which the Indians that were my guides, killed a couple, which we found to be very good and wholesome meate, and very easie to be killed, in regard they are heavy, slow, and not so wild as other Beasts of the wildernesse."

These great, black wood bison which once stood on the Hackensack shore and gazed eastward across the Hudson toward the future metropolis, stood six feet high at the shoulder, were twelve feet long, and weighed as much as a full ton. The head in all-American bison is really of relatively normal size, as in ordinary cattle and oxen, but the great bushy hood, twelve inches long in the beard, gives the appearance of an unbalanced heaviness which is wholly belied by the quickness with which this mighty creature can spin around, ready for attack, almost in the space of its four hooves. Blizzards and bogs were the bison's worst natural hazards. In fact, before the coming of the white man, wolves and Indians were their only enemies. The latter valued them too highly to slaughter them except for immediate food and for the warm robes which their hides provided. Also it took exceedingly good hunting for a horseless brave to creep close enough for his stone-tipped arrow to be effective, and yet himself escape the charge of a wounded animal.

Wolves were an actual influence for fitness in the bison as a whole, canine vitamins of sorts. On the outskirts of every herd or lesser assemblage, invariably could be seen one or more gray wolves, squatted patiently, tongues lolling, eyes unwinking. It was watchful waiting carried to the ultimate degree. The effect was twofold; first, the bulls and cows were never wholly off guard, and young calves were kept on the safe side of the old folks. And secondly, when a cow sickened, or a young bison injured itself, there was small chance of the weakening of the herd by any slowing down to the speed or even continued presence of the weakling. The keen wolfish eyes instantly spotted such a one, and sooner or later he was cut out and pulled down, while the strong, fit individuals continued to hold their own with deadly horn and hoof.

The European Wisent, etymologically the antecedent of our word Bison, is a larger, heavier-bodied animal, with considerably less mane on the fore parts. Caesar found them abundant in Belgium and Germany, but now only a pitiful remnant cling to the forests of the Caucasus, soon to go forever.

Historical times has known only our one member of the family of wild cattle in America, but it is a most noble member, and it is greatly to the credit of our conservationists that the bison — both plains and wood — are permanently preserved from extinction.

Reindeer

To children, especially in the memory of our own youth, it will be no news that caribou or reindeer once inhabited New York City. His was a poor childhood indeed, which cannot recall the "prancing and pawing of each little hoof." And while we may now correctly call the reindeer, *Rangifer caribou,* there was a time when we knew that there were only eight of these wonderful animals, all with never-to-be-forgotten names. In the words of their driver:

"Now, *Dasher!* now, *Dancer!*
now, *Prancer* and *Vixen!*
On, *Comet!* on *Cupid!*
on, *Donder* and *Blitzen!*"

What the yak is to the Tibetans and the Bactrian camel to the Mongolians, the reindeer is to the Lapps. And in recent years its usefulness as a domestic animal has been extended to the Indians and Esquimo of Alaska and Canada. This quality of complete adaptation to mankind is a very curious and unpredictable thing. A wild mallard duck becomes a puddle duck in two generations, while its very close relative, the black duck, remains forever wild; the Indian jungle-fowl and the rock pigeon, accept domestication with, I might say, open wings, while the Javan bird and closely related pigeons never relinquish their wildness. A moose or musk-ox can with difficulty be kept alive in captivity while a reindeer submits to man's care — drawing sledges, providing milk and breeding freely, where horses and cows would freeze to death in a week.

With one of the densest coats of fur and hair known, hooves which splay out into perfect bog trotters and snowshoes, and a digestion which prefers coarse moss, the reindeer is heaven-sent manna to the people of the North.

Our American caribou is very closely related, in fact, most certainly descended from the European reindeer, and the latter name can even more be appropriately used, than in the case of the American robin. No wild reindeer are now to be found in the United States or probably Alaska, but on the great barren grounds of Canada, untold thousands used to migrate south at the end of the short summer, to the pine forests where they could find the moss on which they fed. Early explorers describe the open landscape as darkened with them to the very horizon. In pioneer days of exploration, conservative estimates put the number at hundreds of thousands.

At the beginning of the last, or Fourth Glacial Period, migration on an infinitely greater scale took place. This time it was not to seek new pastures or to avoid plagues of mosquitoes, but an actual forced driving, slowly onward, by an immense, continent-wide glacier. Mastodons, musk-oxen, reindeer, all were driven south, as inevitably as chips on a tidal wave. Myriads of the animals died, but many survived and found food and continued existence possible. In Connecticut, New York, Pennsylvania and New Jersey we know the reindeer lived and died throughout hundreds of years. Later, the survivors followed the retreating ice northward, on and on, to the ultimate land, scarcely four hundred miles from the Pole itself. Today we find the remains of reindeer — skulls, bones, antlers — in the clay and peat bogs, sometimes within fifteen miles of Greater New York City.

Again, past ages have made scientific fact of part of a child's beloved legend. The reindeer have been New Yorkers, whether chronologically, during the receding of the final glacier of the Pleistocene, or when " 'Twas the night before Christmas."

Puma

In the more or less good old days, pumas or mountain lions were abundant throughout New England and New York. One hundred and eighty-odd years ago, within one hundred miles of Philadelphia, a county drive and shoot under the pretense of decimating varmints, slaughtered "41 Panthers, 109 Wolves, 112 Foxes, 114 Mountain Cats, 17 Black Bears, 1 White Bear (albino?), 2 Elk, 98 Deer, 111 Buffaloes, 3 Fishers, 1 Otter, 12 Gluttons, 3 Beavers and upwards of 500 smaller animals." And it is added that twice as many panthers escaped as were killed. The local Indians so resented this senseless killing of their staff of life that not long afterwards, they ambushed the leading hunter and slew him.

One authority reported that in New Jersey there were many more pumas than wild cats, and a leading conservationist tells of reliable rumors that stray animals still lived in the Adirondacks between the years 1900 and 1909. But the puma has gone forever from New York City and holds its numbers only in such distant places as Florida, Louisiana and the west.

In old New York the Dutch settlers believed in the mountain lion in a very realistic way, and when the Indians brought in the skins for sale they wondered at the absence of a mane, and why only lionesses were killed. Whereat the Indians, like their obliging descendants today everywhere in the wild, naively concocted the tale that the male lions lived in high mountains, many days' travel away, and were too active and fierce to be killed.

The degree to which any creature enters into the life of mankind is evinced by the number and character of its names. Mr. Seton has compiled the following list: Cougar, Puma, Panther, Painter, Catamount, Mountain Lion, Brown Tiger, Varmint, Sneak-Cat, Red Tiger, Silver Lion, Purple Feather, Deer-killer, Indian Devil, Mountain Devil, Mountain Demon, Mountain Screamer and King-cat. Of these names, more are devoted to the color and the voice than indicating that the puma was a dangerous animal. It fed, as a matter of fact, on every type of edible creature from grasshoppers to elk and buffalo, with a lamentable preference for the dainty flesh of young colts and calves when obtainable. But man and child seemed always immune from unprovoked attack.

There has been much controversy about even the ability of a puma to scream or to utter any loud outcry. I once stood in front of a cage in the Bronx Zoo close on midnight, and watched the tawny gray inmate as it gave utterance to a loud, long-drawnout, quavering cry which seemed as if it would never stop, and epitomized the essence of wild nature. To imagine it, multiply the most awesome yowl of a back fence tommy by several times its amount of ominous, menacing, portentous, terrifying, appalling character, and you will realize what must now and then have frightened little Dutch babies fairly out of their cradles as they lay shivering in their father's log cabins in the wilds of Westchester many, many years ago.

Wild Turkey

To the modern city dweller, the American turkey is typified by the crowded, bedraggled inhabitants of crates, bouncing along our streets, on their way to some killing station for turkeys. This is especially true of the season of Thanksgiving (for everyone except the unfortunate birds). Then again we see them suspended in long dismal lines in butcher shops, indecently naked, fulfilling Plato's definition of mankind, "Featherless Bipeds!" Even the casual kibitzer can tell that the birds in the crates are not wild turkeys, for if only a single, mussed tail feather remains, its broad tip will be seen to be white, and not, as in our splendid northern wild turkey, a rich rufous brown.

In the early 1600's turkeys were abundant everywhere on Manhattan and on Long Island, and their *gobble-obble-obble* must have often rung out on what was to become Fifth Avenue and the Battery. They held their own with the Indians, for their senses were keen, and their woodcraft far excelled that of the Redman. Even the blunderbusses of the Dutch could hardly have reached the roosting places in the tops of high trees. So they continued to live and thrive, with frequent nocturnal forays to cultivated corn fields.

Even before Henry Hudson sailed up the narrows, the northern wild turkey was described by the French explorer, Champlain. His testimony was as follows: "The savages, along all these coasts where we have been, say that other birds, which are very large, come along when their corn is ripe. They imitated for us their cry, which resembled that of the turkey. They showed us their feathers in several places with which they feather their arrows and which they put on their head for decoration, and also a kind of hair which they have under their throat like those we have in France, and they say that a red crest falls over the head."

The first official Thanksgiving, proclaimed by Governor Bradford of Massachusetts, was in 1621, and celebrated with the dedication to this feast of wild turkeys. Twenty years later, a writer in New Netherland says of Manhattan, "there were so many Turkies and Derr that they came to feed by the house and hog pens, and were taken by the Indians in such numbers that a deer or three turkies were sold for a loaf of bread or a knife, or even for a tobacco pipe, but now one commonly has to give for a good deer six or seven guilders."

There must have been a certain day when a marauding gobbler on our island heard a liquid challenge from the very door-yard of a Dutch farmhouse. He answered angrily and proudly. The two birds drew together, and in the moonlight a battle to the death was waged — the white-tailed against the brown-tailed. The latter won, we may be sure, for the tame bird had weakened and degenerated during his long domestication. His forefathers had been brought by the Spaniards, more than a century before, from Mexico, and had spread over Europe. Now he had again crossed the ocean, and met the wild bird of New England.

Today, in the 1940's, the wild turkey, like the crow, still pits his wits against man's deadly snares and guns, and still continues to hold his own in wild and isolated forests. Long may his electric, vocal thunder be heard — a sound which unites the past with the present.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

BLACK BABIES

Young cat animals of whatever sort are always great attractions for Zoological Park visitors but, like so many other good things, are not easily come by. Lion cubs we can sometimes manage, but they grow up so quickly that within a few months they are just more lions to swell an indisposable surplus. Tigers have never been successfully reared in the Zoological Park, although we are definitely ambitious in that respect and have hopes of final achievement.

Leopards are certainly as difficult to breed as are tigers and since Black Leopards have a reputation for extreme nervousness and ferocity, they would appear to be practically impossible as parents.

This makes it all the more astonishing that our pair of Black Leopards should have defied tradition last year by producing and rearing a fine black youngster. The parents remained together through the entire period and the father took a deep if passive interest in the youngster.

This year our model parents have presented us with a pair of babies, born on July 23 but not actually seen by us for at least a month afterward. Early in September the young leopards began making brief excursions from their inner nursery in the Lion House and we may expect them to furnish many hours of entertainment for our autumn visitors.— L. S. C.

THE PASSING OF ALICE

Old Alice, our oldest elephant, was quietly and painlessly put to sleep with an overdose of anaesthetic on August 27 after she was found helplessly lying in her stall for the second time in a week. A rheumatic hind leg gave way on her four days before and she was helped up by a derrick — the fourth time in three years that its services were required — but when she went down for the fifth time it was obvious that it was useless to prolong her life. Alice herself seemed to have given up, for she made no effort to rise or even to eat the delicacies which Dick Richards, her keeper for her entire life in the Zoo, pressed upon her.

The date of Alice's birth is uncertain, but Dr. Hornaday estimated it as 1893 when she came to the Zoo from Coney Island on September 3, 1908. She had lived at the Zoo for 34 years, 11 months and 24 days.

Her turbulent history during that time has been chronicled in the *Bulletin* and in *Animal Kingdom* many times, most recently in an article, "Twelve Elephants," in the issue of September-October, 1941.

The passing of Alice leaves us with two young Indian elephants and one of the African species. They are all good elephants. But there was only one Alice.

* * *

Frank Rizzi, printer of the Zoo's animal labels until he enlisted in the Army shortly after Pearl Harbor, has been awarded the Distinguished Flying Cross for more than 200 hours of operational flying in the New Guinea area.

* * *

The exhibition of Otters by Emil Liers of Winona, Minn., known as "the Otter Man," closed at the Zoological Park on September 12 after daily performances through the summer. The show was highly successful.

* * *

Our Patagonian Cavy exhibit in the old Prairie Dog enclosure is flourishing. Seven babies have been born since April 3, the latest pair on August 7.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Life

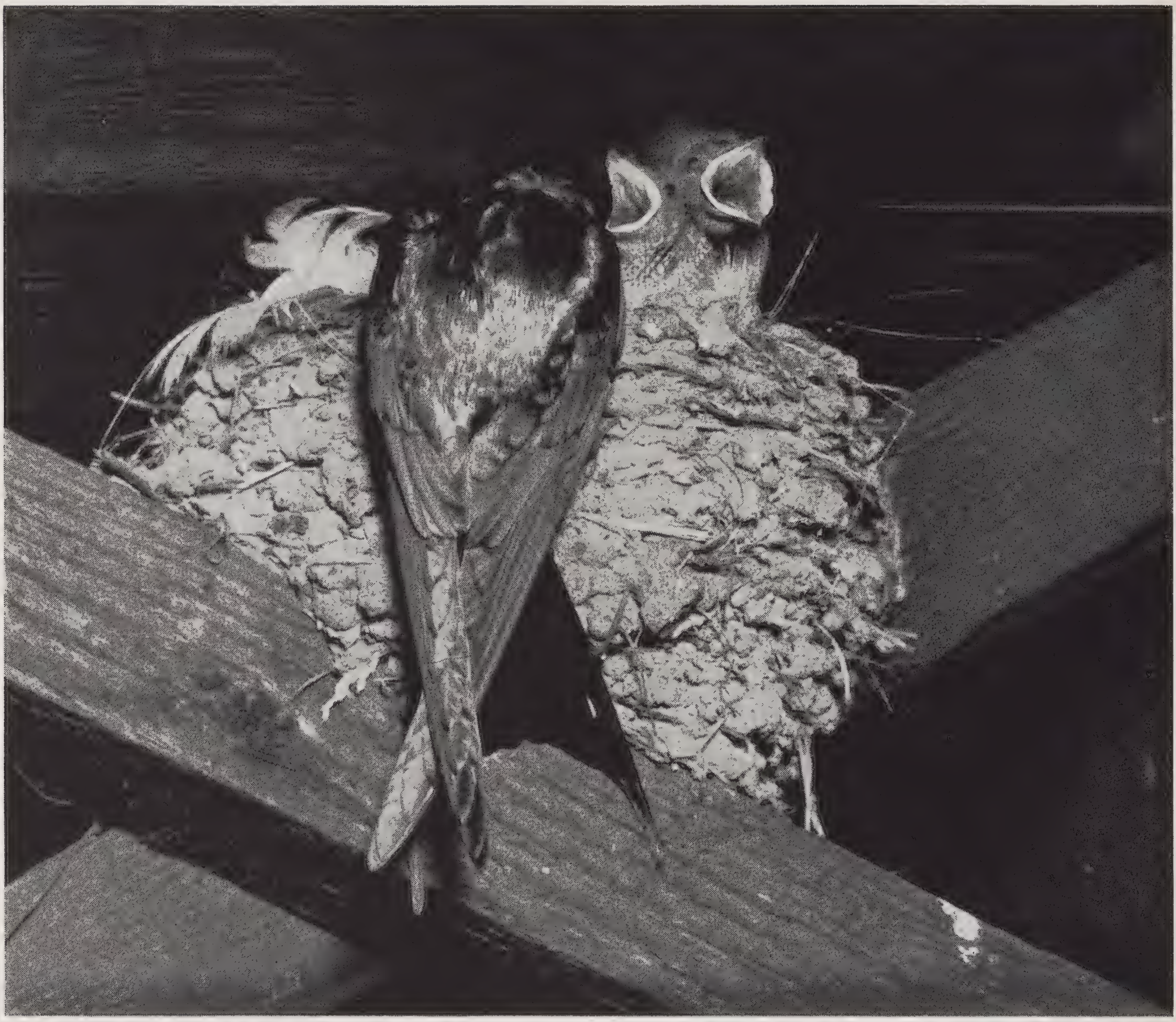
Arthur H. Samish

Annual

Corwin Black
Ruth M. Mueller
Rodolphe E. Rufenacht
Samson Selig

Junior

Frederick Cohen
Irwin Fridovich
Abraham Miller
Wendy Dawson Roth



Inside a busy garage, where trucks are coming and going all day long, is hardly the place one would expect a Barn Swallow to choose as a nesting place. Yet that is the latest home of two Swallows from the colony now apparently established in the Zoological Park. The brood was successfully reared in the garage this summer.

BARN SWALLOWS IN THE ZOO

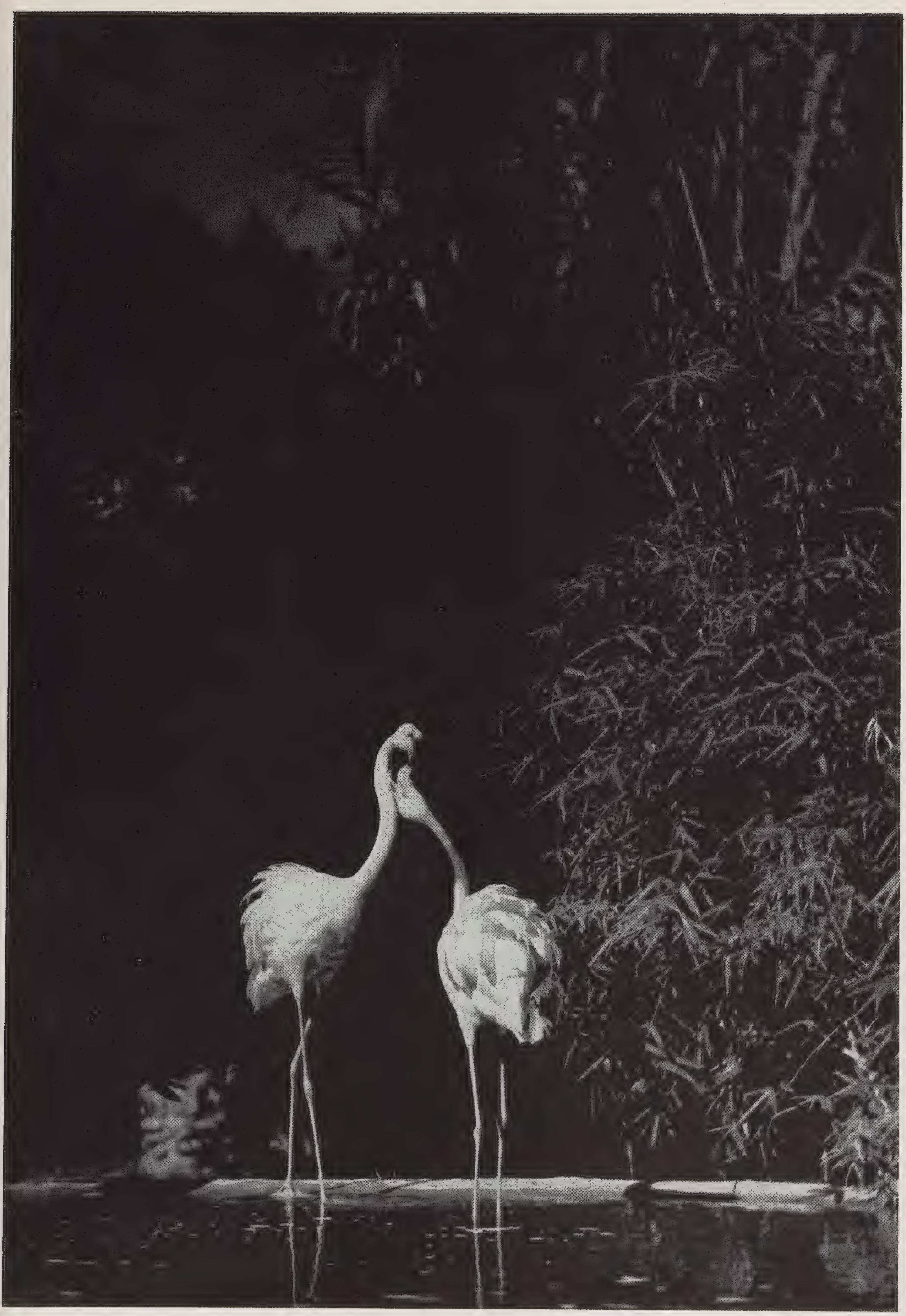
Photographs of young birds in the nest seem never to lose their intrinsic appeal. The picture at the top of this page has the added attraction of depicting one of our most beautiful and useful species, the Barn Swallow.

In the early days, Barn Swallows were missing from the environs of the Zoological Park but a stray pair finally settled under the eaves of the old Elk Shelter. This chance decision marked the beginning of a colony which spread to the Yak House and then to the garage in the Service Yard of the Zoo, where this photograph was made this summer. It was the first year the Swallows had nested in that part of the Zoological Park. – L. S. C.

A GREAT FLAMINGO PICTURE

If the amateur photographer needs any encouragement (most of them would be satisfied if they could just get film!) he can study the extraordinary photograph on the opposite page. It is the work of G. E. Kirkpatrick, a bus driver and camera enthusiast at the San Diego Zoo.

Mrs. Belle J. Benchley, through whose courtesy the picture is reproduced after it appeared on the cover of *The San Diego Zoonooz,* says that "it is one of those rare shots that patient photographers sometimes secure." Luck may have entered into the taking, also, but whether as a result of patience or luck, it is certainly one of the most graceful and striking Flamingo pictures we have ever seen.



A pair of Flamingoes "billing," as photographed at the San Diego, California, Zoo by G. E. Kirkpatrick. The photographer is an amateur who evidently has an eye for striking postures and composition of his pictures.

PUBLICATIONS OF INTEREST

EXTINCT AND VANISHING MAMMALS OF THE WESTERN HEMISPHERE. By Glover M. Allen. Published by the American Committee for International Wild Life Protection, 1942. 25 illustrations, 622+xv pages, $4.50.

This is a very important and lamentably significant volume of the result of lack of adequate conservation of wild life in past years. It is a thorough review of the field indicated in the title, and is divided into three sections; North America and the West Indies, South America, and Oceanic Mammals.

The text module is a sentence from Henry D. Thoreau; "Every creature is better alive than dead, men and moose and pine-trees, and he who understands it aright will rather preserve its life than destroy it." It is evident that insularity has been a dominant if indirect factor in causing rarity or extermination. About one hundred species of mammals are listed in the first section, of which more than sixty lived and died on the West India Islands. With the exception of ground sloths, these were, of course, small species.

The account of the decimation or actual extermination of such splendid creatures as wolves, pumas, caribou, prong-horns, mountain sheep, seals and whales makes a sorry chapter in the history of the coming of mankind to the New World. But this volume does a great deal toward the redemption of past sins, in its straightforward, unsentimentalized facts and figures, and should exert a wide influence in establishing a new and closer relationship, a better understanding (I use the mutual adverb advisedly) between ourselves and our fellow mammals on our planet.

This volume is an excellent piece of bookmaking as to paper and type, and an adequate bibliography and index provide a well rounded presentation. Except for the absence of the magnificent color plates, it is a worthy companion of Rothschild's "Extinct Birds." Allen's book is marked as Special Publication No. 11, of the American Committee. Interested readers would have appreciated a list of the preceding ten.

Especially is the work to be praised because of its appearance at a time such as this when the very life of institutions, states and nations hangs in the balance. It is a pity that the great naturalist author, Dr. Glover M. Allen, while he completed the manuscript, did not live to see his splendid volume in its published form.—*Wm. Beebe.*

MEETING THE MAMMALS. By Victor H. Cahalane. With 52 drawings in black and white by Walter A. Weber. The Macmillan Company, New York, 1943. 133 pp. $1.75.

The subject matter of this excellent little book is somewhat more restricted than the title might indicate, since it includes only such mammals as may be seen in National Parks and "Monuments," west of the Mississippi River. These, however, Mr. Cahalane has covered thoroughly well, in a style excellently suited to a popular handbook. Sixty-six of the most-likely-to-be-seen mammals are briefly described, as to characteristic habits and physical points of identification. Mr. Weber's drawings are very good, indeed, and add much to the attractiveness of the volume. Many readers will long for gasoline enough to make the obviously best use of such a book!—*L.S.Crandall.*

THE GRASSHOPPER BOOK. By Wilfrid S. Bronson. Harcourt, Brace and Co., New York, 1943. 127 pages, 35 illustrations by author. $1.75.

This is the best popular treatment of the subject that I have seen. It covers not only the grasshoppers, but also their kindred, from the roaches and walking-sticks to the crickets and katydids.

After commencing with a general survey of grasshoppers, Mr. Bronson describes the most important parts of the grasshopper anatomy as well as their functions; how they breathe, lay their eggs, jump and sing. Subsequently, since most of us want to have a name for what we see, he devotes a chapter to the various kinds of grasshoppers and to each of their relatives, the musical-winged katydids and crickets, the fleet roaches, the mimical walking-sticks and, as the author says, the "preying praying mantises." The accompanying semi-technical figures drawn with exactness and humor admirably clarify an already lucid text.

Those of us, man or boy, who are interested in nature and her ways will certainly welcome *The Grasshopper Book* with its informal and simple manner of introducing us to the ever present jumping and singing tribe of the insect world. —*Henry Fleming.*

THE AMERICAN BISON

by

MARTIN S. GARRETSON

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for accounts of it, pictures its wide range and incredible numbers. This is the story of exploitation, near-extermination, and the rise of a strong national sentiment that saved the species.

254 pages, 65 illustrations *$1.50*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

PRESENT DAY MAMMALS

by

CLAUDE W. LEISTER

Students in Zoology and Biology classes, as well as the general reader who has often been puzzled by the relationship of mammal groups, will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. Typical representatives of every Order of mammals are pictured, and there is a clear text explaining the zoological status of the animals.

74 pages, 106 illustrations *50 cents*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

TROPICAL WILD LIFE IN BRITISH GUIANA

by

WILLIAM BEEBE, G. INNESS
HARTLEY & PAUL G. HOWES

Under the prosaic subtitle of "Zoological Contributions from the Tropical Research Station" Dr. Beebe and his associates produced a fascinating survey of subhuman life in a tropical jungle—mammals, birds, reptiles, insects, fish. Here are elaborate notes on the curious Hoatzins, descriptions of a tropical expedition at work, scores of magnificent jungle pictures. An early book by Dr. Beebe, but one packed with interest.

504 pages, 143 illustrations *$1.50*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

SERPENTS of the NORTHEASTERN STATES

by

RAYMOND L. DITMARS

There are many books on the identification of our local snakes, but this is still the simplest and in many ways the most practical for the layman who wants to know enough about snakes at least to keep out of their way! It tells what snakes are found in the Northeastern States, where they are most likely to be found, what to do if you are bitten by a poisonous snake, what they look like. Photographs of every species in this area.

60 pages, 41 illustrations *50 cents*

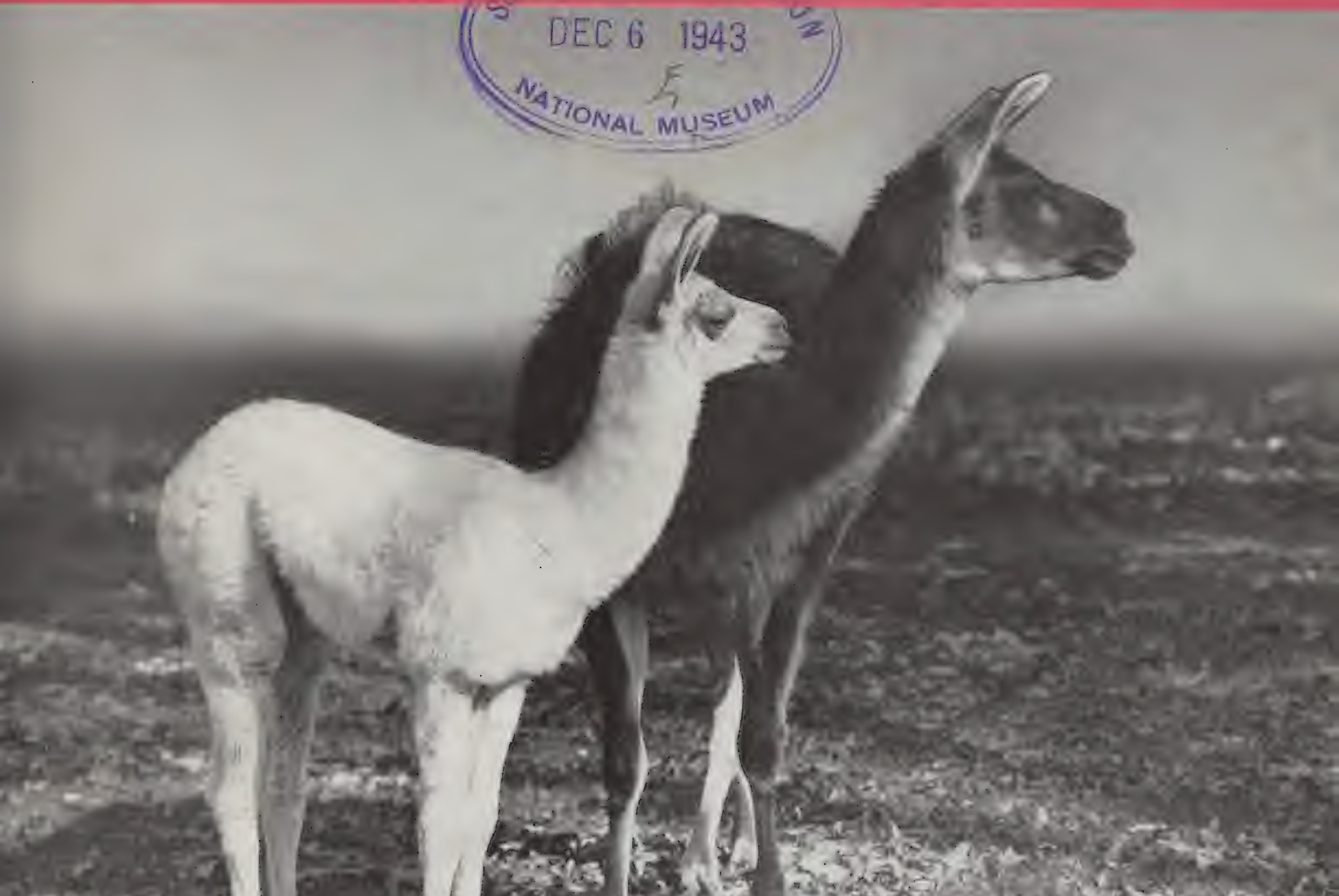
Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

XLVI · No. 6 NOVEMBER–DECEMBER 194

590.673
A59

ANIMAL KINGDOM

SMITHSONIAN INSTITUTION
DEC 6 1943
NATIONAL MUSEUM



BULLETIN, PUBLISHED BY
NEW YORK ZOOLOGICAL SOCIETY

UT OUR TWO BABY GORILLAS, *by Claude W. Leister* · CHIPMUNKS AND THEIR SECRETS
a G. Allen · WINTER SCHOOLS OF FISH · NOTES FROM THE ZOOLOGICAL PAR

NEW YORK ZOOLOGICAL SOCIETY

General Offices: 630 Fifth Avenue, New York 20, N. Y.

PRESIDENT
Fairfield Osborn

FIRST VICE-PRESIDENT
Alfred Ely

SECOND VICE-PRESIDENT
Laurance S. Rockefeller

SECRETARY
Harold J. O'Connell

TREASURER
Cornelius R. Agnew

EXECUTIVE COMMITTEE
Fairfield Osborn, *Chairman*

Cornelius R. Agnew
Alfred Ely
Marshall Field
De Forest Grant
Warren Kinney
William De Forest Manice
David H. McAlpin
Robert Moses
Laurance S. Rockefeller

BOARD OF TRUSTEES

Class of 1944

Archibald S. Alexander
Harry Payne Bingham
A. Raymond Dochez
De Forest Grant
Eugene Holman
Warren Kinney
Henry R. Luce
William De Forest Manice
Harold J. O'Connell
Dean Sage, Jr.
Landon K. Thorne
J. Watson Webb

Class of 1945

Cornelius R. Agnew
C. Suydam Cutting
Alfred Ely
Marshall Field
Childs Frick
Archer M. Huntington
David H. McAlpin
John H. H. Phipps
Clendenin J. Ryan
Herbert L. Satterlee
Harrison Williams

Class of 1946

George Gordon Battle
George C. Clark
F. Trubee Davison
Jay Downer
Robert I. Gannon
Robert Gordon McKay
Fairfield Osborn
Laurance S. Rockefeller
John M. Schiff
Frederic C. Walcott

Ex-officio, The City of New York
The Mayor, Hon. Fiorello H. LaGuardia
Commissioner of Parks, Hon. Robert Moses

GENERAL STAFF

John Tee-Van . . . . . . *Executive Secretary*
Jean Delacour . . . . . . *Technical Adviser*
William Bridges . . *Editor & Curator, Publications*
Sanford Miles . . . . *Comptroller*
Claude W. Leister . . . . *Curator, Education*
Donald Marcy . . . . . *Associate, Education*
Millward W. Heath . . . *Supt., Construction & Maintenance*

ZOOLOGICAL PARK

Lee S. Crandall . *General Curator & Curator of Birds*
Claude W. Leister . . . . *Associate, Mammals*
John Tee-Van . . . . . . *Associate, Reptiles*
Leonard J. Goss . . . . *Veterinarian*
Harry C. Raven . . . . . *Associate, Anatomy*
Grace Davall . . . . *Assistant to General Curator*
W. Reid Blair . . . . . . *Director Emeritus*
William Beebe . . . . *Honorary Curator, Birds*

AQUARIUM

Charles M. Breder, Jr. . . . . . . *Director*
Christopher W. Coates . . . . . . *Aquarist*
Ross F. Nigrelli . . . . *Pathologist*
Myron Gordon . *Research Associate in Genetics*
George M. Smith . *Research Associate in Pathology*
Homer W. Smith . *Research Associate in Physiology*
Charles H. Townsend . . . . *Director Emeritus*

DEPARTMENT OF TROPICAL RESEARCH

William Beebe, *Director*
Jocelyn Crane . . . . . *Research Zoologist*
Henry Fleming . . . . *Entomologist*
George Swanson . . . . *Staff Artist*

Associates

William K. Gregory
John Tee-Van
Gloria Hollister
Mary VanderPyl

ANIMAL KINGDOM

BULLETIN OF THE NEW YORK ZOOLOGICAL SOCIETY

Vol. XLVI DECEMBER 1, 1943 No. 6

Issued bi-monthly at the Offices of the New York Zoological Society, 630 Fifth Avenue, New York 20, N. Y. Editorial and Subscription Offices, Zoological Park, Bronx Park, New York 60, N. Y. Title registered with United States Patent Office.

Subscription, $1.50 a year; single copy, 35 cents. Same rates for all foreign countries and Canada. All pictures not otherwise credited are from the photographic collection of the New York Zoological Society.

The Pacific World

The text and illustrations of a book on the Pacific, to be entitled "The Pacific World," will shortly go to press. It will describe this vast ocean area, its islands, great and small, its animal life, its plant life and its native peoples. The book will contain a series of original graphic drawings, illustrations and charts. There is also to be published a series of handbooks on Mammals, Birds, Reptiles, Fishes, Insects, Marine Invertebrates, Plant Life and Native Peoples. One of the several purposes of these publications is to emphasize the conservation of the animal life of the Pacific Islands. The entire series is to be distributed in large quantities to our Armed Services. There will also be editions for distribution to the general public.

The Zoological Society is fortunate in its opportunity to play an active part in the preparation of these books in collaboration with seven other educational and scientific institutions.

Mention is made here of these publications not so much for the purpose of making an announcement but rather to confirm the policy which has so frequently been expressed here—namely, that the Zoological Society shall realize upon every possible opportunity which may come to it, of conveying to the general public information regarding the animal life of this world.

It is expected that "The Pacific World" and the supplementary handbooks will be available shortly after the turn of the year.

Fairfield Osborn

IN THIS ISSUE

Llama Family . . . . *Sam Dunton* COVER
Two Healthy Baby Gorillas . . . . *Claude W. Leister* 123
Winter Get-together: Fish Aggregations . . . *Pictures* 129
Chipmunk Secrets . . . . *Elsa G. Allen* 133
Behind the Scenes: News and Notes 141
Index to Volume XLVI 142

SHOP TALK

CHIPMUNKS may seem an odd subject to have as one's specialty, but they can be fascinating and there's plenty to learn about them. Elsa G. Allen, who writes "Chipmunk Secrets" in this issue, is the wife of Dr. A. A. Allen, professor of ornithology at Cornell University. She probably knows more about chipmunks than anyone else in the United States.

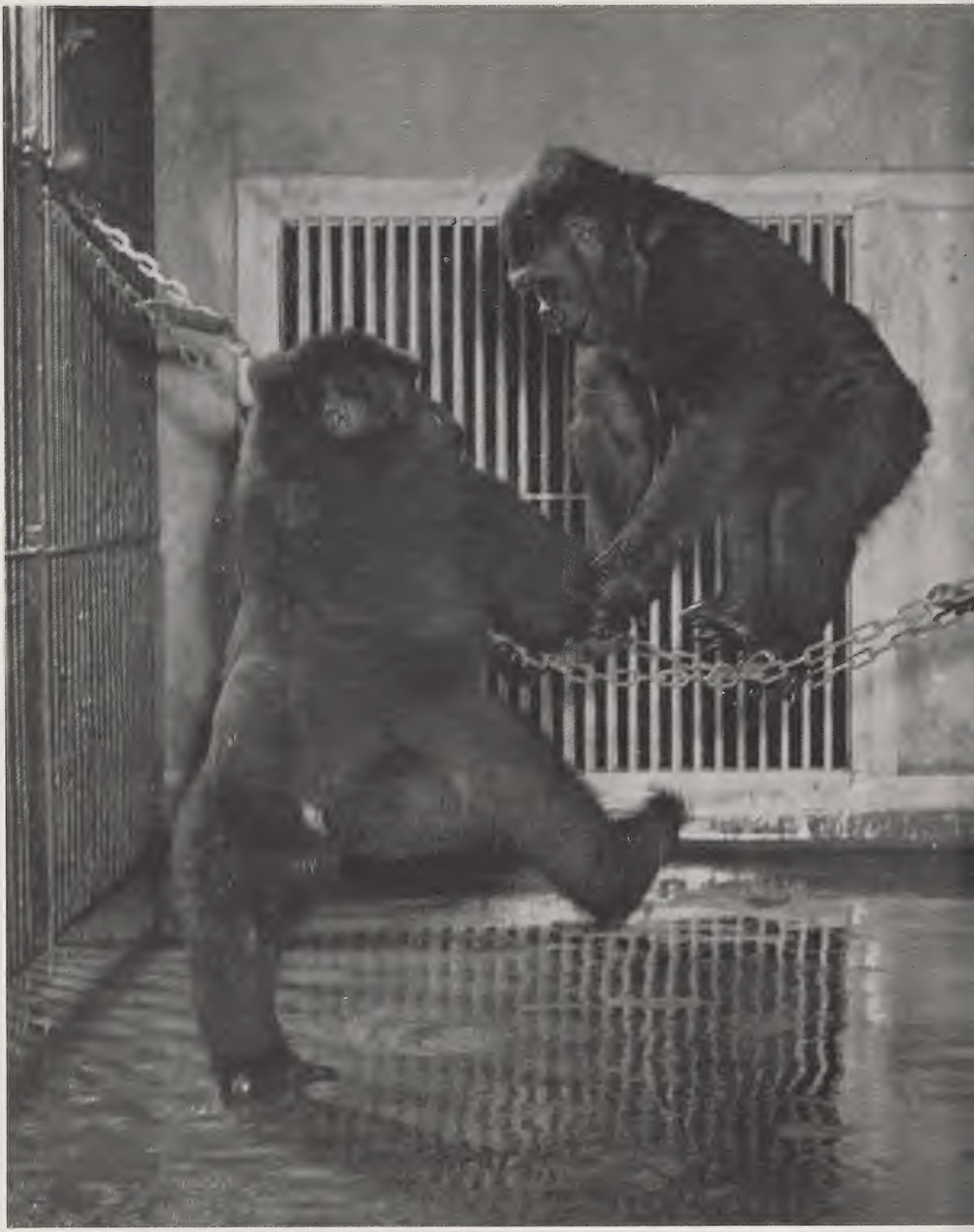
* * *

ANIMAL photography is an art—if, as we sometimes suspect, it isn't nine-tenths luck. If anyone doubts this, all he has to do is to step inside the Heads and Horns Museum Gallery any day this winter and take a good, careful look at the fifty-some-odd animal pictures made by Zoo staff photographers in the last twenty years.

* * *

GOOD stories lurk behind the animal pets service men bring home and give to the Zoo. Usually we don't hear the full story, but you can fill in the gaps yourself in the tale told us about a scrappy little Margay cat that came up from Brazil. According to the sailor who presented it, a friend of his went ashore one night in Bahia. Next morning he woke up in his own bunk aboard ship, with a Margay kitten curled up beside him. He didn't have any recollection of how he or the cat got there!

Another story we'd like to know more about concerns a pair of Flying Phalangers from New Guinea. Seems a sailor went ashore to look at the damage done during a recent battle. He heard a rustle in the top of a palm tree and got ready to shoot. Just before he fired, a terrified native came sliding down the tree trunk, holding something in his hand. It was the Phalangers—and he was so grateful to the American for not shooting first and investigating afterward that he gave him the little animals. They got to be a maintenance problem aboard ship, so now we have them. — The Editor.



"Healthy" is exactly the word for our two baby Gorillas, for they eat voraciously, play strenuously and sleep soundly. Although they have separate compartments in the Gorilla House, they are permitted to play together for a few hours each day.

Two Healthy Baby Gorillas

Our Youngsters, Makoko and Oka, Are Growing So Strong That It Is a Problem to House Them Satisfactorily.

CLAUDE W. LEISTER

OUR YOUNG GORILLAS, Mokoko and Oka, are the Zoo's two problem children. They are growing so rapidly that it seems as if they are continually in need of larger and stronger quarters. Their first home, the Gorilla Room in the Lion House, lasted for less than two years. Growth was so rapid that glass and wire mesh could no longer withstand their rough and tumble tactics.

When the old Primate House was overhauled recently the needs of these two youngsters were so much in mind that the building has been renamed the Gorilla House. Here they now romp and play in roomy quarters, plentifully supplied with fresh air and separated from the visiting public by a glass barrier. A new and permanent home has been planned for them but its completion must await the end of this war.

Makoko and Oka arrived at the Zoological Park on September 7, 1941. Both were in good physical condition; in fact, they are the only really healthy gorillas ever received at the Park. Makoko, the male, weighed 28 pounds, and Oka, the female weighed 20. With fortunately few upsets they have been in excellent health ever since and each has shown a steady gain in size and weight. Makoko continues to be somewhat the heavier, at 88 pounds, while Oka weighs 71.

Makoko is an independent, rather suspicious youngster, about six years old, who takes nothing for granted and always insists upon working things out in his own way. He uncannily senses the arrival of "moving day" and at weighing time refuses to step on the scales but rather likes to go through this process while standing on his keeper's back.[1] Five-year old Oka, on the other hand, is a confiding little miss, always cheerful in disposition and as lovable as can be.

Both gorillas occasionally show an obstinate persistency apparently common to all of their kind. At such times Oka, because of her gentle disposition, can still be picked up and handled. But not so with Makoko. He quickly conveys the impression that while he may weigh only 80 pounds, he is all gorilla and that no one is to take any liberties with him.

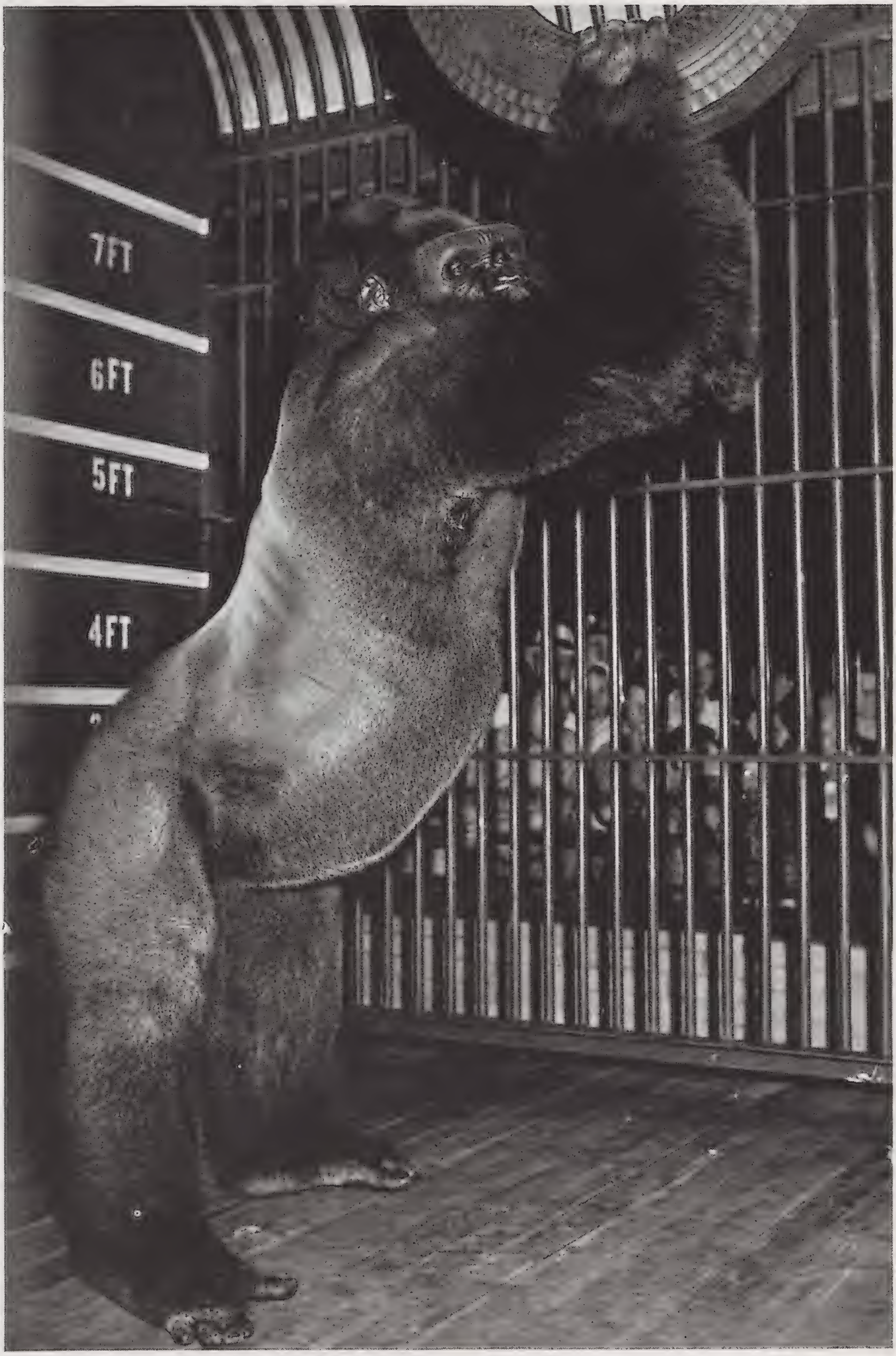
Park visitors are entranced by the day-long acrobatics and the many human traits of our gorillas. Questions concerning these anthropoids are frequent and it is probable that they arouse more curiosity than any other of our Zoo inhabitants.

* * *

The gorilla was almost a legendary animal and practically nothing was known of this "king of the man-like apes" until the publication of Paul Du Chaillu's "Explorations and Adventures in Equatorial Africa" in 1861. His gorilla tales created a sensation, not only with the general public but among scientists as well. Many of Du Chaillu's observations have stood the test of time, although some of his stories, especially those portraying the gorilla as one of the most savage and ferocious animals in the world, were apparently inspired by native superstition and ignorance, and today are known to be largely untrue. At any rate, the gorilla emerged as a

---

[1] See the illustration in ANIMAL KINGDOM, May-June, 1943, page 72.



Courtesy Lincoln Park Zoo, Chicago

"Bushman," the famous Gorilla in the Lincoln Park Zoo in Chicago, is certainly one of the finest specimens in the zoos of the world. His recent weight of 515 pounds makes him second in size to Ngagi (638 pounds) in the San Diego Zoo. He is all muscle and there is very little fat on his powerful body, as this photograph shows. The scale of measurements on the wall indicate his impressive standing height. Even on all fours, he is about 4 ft. high.

remarkable personality and has gained in stature as we learned more about it during the ensuing years.

Two distinct geographical races of the gorilla are recognized and they are found only in two areas of Central Africa. The coast or lowland gorilla (*Gorilla gorilla gorilla*) inhabits an approximately five-hundred-mile-square area in the equatorial rain forests adjacent to the Gulf of Guinea. The home of the mountain gorilla (*Gorilla gorilla berengei*) is found more than five hundred miles to the east, just west of Lake Tanganyika, in the mountains along the eastern border of the Belgian Congo.

These two races are much alike in all respects and there is no single characteristic or anatomical feature that serves infallibly to tell them apart. In general, however, the mountain gorilla has a longer and heavier coat of hair, probably grows to a larger size and is more imposing in manner. There is still some confusion in identifying the different races, and characteristics supposed to be diagnostic for one have also been found in the other.

Following Du Chaillu, it was almost half a century before we began to add appreciably to our knowledge concerning the gorilla. Several zoologically-minded explorers penetrated the gorilla country. Specimens of both races were secured for museums. More and more life-history facts were discovered. A few baby gorillas were brought out into civilization but all of these died promptly, for we had not learned their requirements. As for the adults, to this day a mature gorilla has never been captured alive and only within the last decade have we been privileged to see fully-grown specimens—always youngsters that have grown up in captivity.

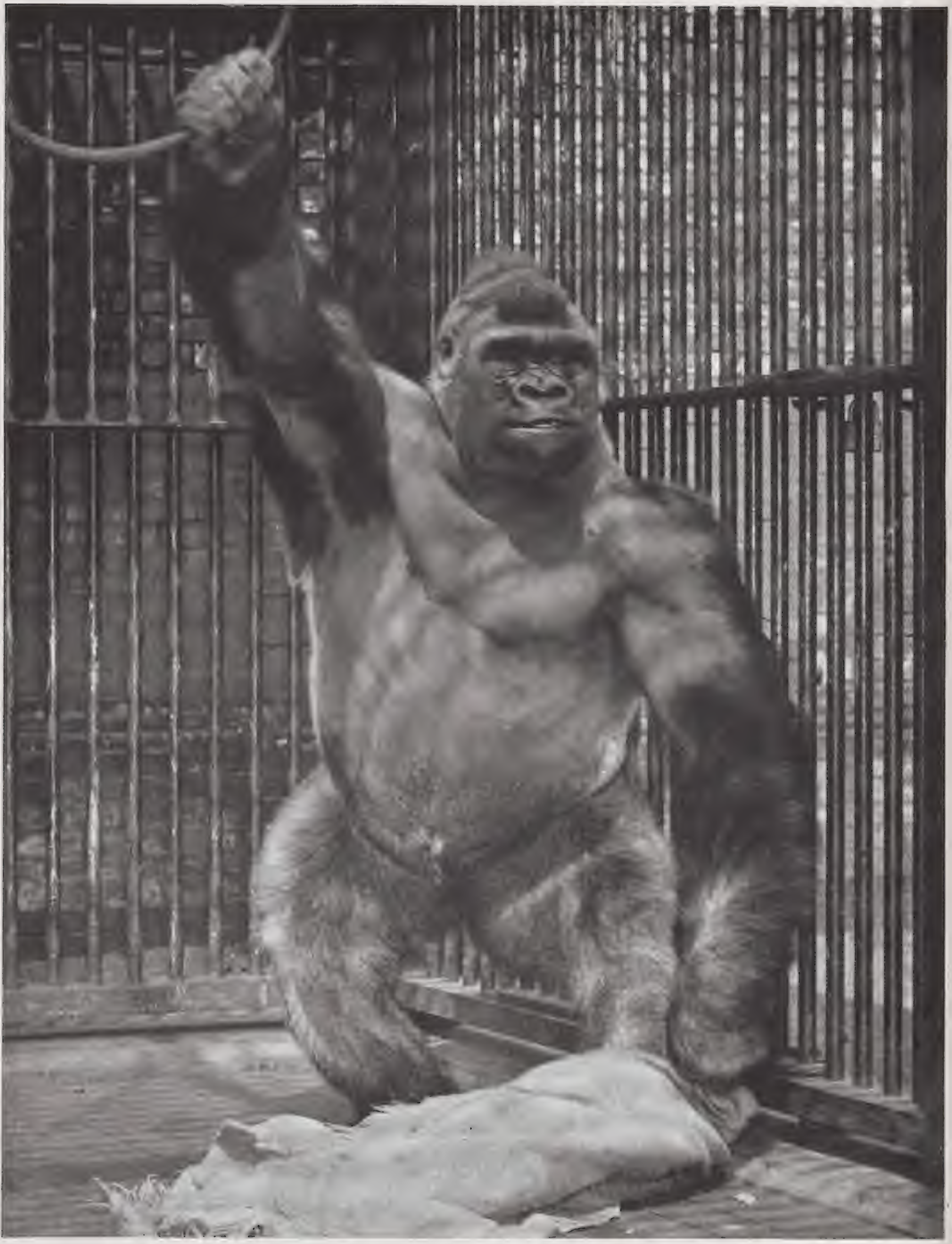
The first gorilla to come to America was obtained by an animal trainer in Boston in 1897 but apparently survived the voyage by only five days and was never exhibited.

The Zoological Park's first infant gorilla arrived in 1911, but she too was in poor condition and died twelve days later. Our second gorilla was Dinah, a three-year-old female coast gorilla from French West Africa. She lived for a few days over eleven months—the first gorilla to be exhibited in an American zoo. "Dinah" taught us a lot about the care of gorillas but we did not try again until 1928 with the arrival of "Janet Penserosa," a wizened little black-faced mite about 18 months old and weighing 17 pounds. Badly nourished and afflicted with a skin disease, she nevertheless responded to good treatment and survived to 1941. She was probably the most closely studied gorilla in America.

In the meantime other gorillas had arrived and gone to other zoos. Most of them survived. Experience had shown that it was useless to attempt to bring these great apes out of Africa without giving special attention to dietary and general sanitary conditions. Most of the youngsters brought to America were lost, not through lack of proper care here in this country, but because of previous exposure to unsanitary living conditions and infectious or contagious diseases.

Most primates, and gorillas especially, have little resistance to man's diseases, especially those of pulmonary origin. These, and disorders due to faulty diet, have accounted for the untimely deaths of most of our baby gorillas. At least two in this country have suffered and survived an attack of poliomyelitis, the dreaded infantile paralysis. Through better feeding methods, good sanitation, and a minimum of close association with humans, young gorillas now have a good chance of surviving to maturity.

Only a few years ago any zoo director's greatest ambition was to exhibit a gorilla. At this writing, there are no less than eighteen gorillas in America, varying in age from babies two years old to full-grown, adult animals of seventeen years. Ngagi, the 638-pound, seventeen-year-old gorilla of the San Diego Zoo, is the largest in America, an honor he acquired upon the death of his companion Mbongo after a short illness in 1942. Four other famous Zoo gorillas, are Bushman (perhaps the most magnificent of all), weight 515 pounds and 15 years old, at the Lincoln Park Zoo in Chicago; Massa, seventeen years old, weight 375 pounds, and Bamboo 15 years old, weight 435 pounds, both at the Philadelphia Zoo; all of these are males, but Susie of the Cincinnati Zoo holds her own at 400 pounds. Her age is seventeen. She has the added reputation of being the only "educated" gorilla in the country, for she has learned to ring a bell



Courtesy Philadelphia Zoological Society

The pride of the Philadelphia Zoo is "Massa," 17 years old and weighing 375 pounds. Massa is one of the best showmen in the Zoo; he loves to thump his chest and exhibit the "fierce" behavior that the public believes to be characteristic of Gorillas, and the gathering of a crowd is always a signal for him to begin his performances. This particular pose shows off well the magnificent chest development and powerful arms of a full-grown Gorilla.

for table service, and to use knife, fork and spoon in a ladylike manner.

The two best-known gorillas in America are the much publicized circus animals, Gargantua and Toto. Thirteen-year old Gargantua, the male, is said to tip the scales at 550 pounds and Toto's 400 pounds were acquired in only twelve years.

Toto was a spoiled young lady living among luxurious surroundings in Havana when she was acquired by the Ringling Bros. circus in 1941 for the wishful purpose of becoming Mrs. Gargantua. As yet a real mating has not been accomplished and, as a matter of fact, neither animal has shown any particular interest in the other. Until the day arrives when it can be said that love has come to Gargantua and Toto, the risks involved in putting them together are too great to be ignored. No one would appreciate the job of separating 900 pounds of fighting gorilla.

A most remarkable and almost unbelievable change takes place in gorillas between babyhood and maturity. The appealing, little, almost-human infants are about the same weight as a human baby at birth and give no indication of the hulking animals they may become in fifteen or sixteen years. Males are larger than females and are generally more temperamental and difficult to handle. However, as time goes on and we learn more and more about gorillas it is evident that each individual has his own distinct personality and must be treated accordingly. Our own Makoko and Oka are like many a human brother and sister—and just as unpredictable. But likes and dislikes, capabilities and accomplishments fall into a definite pattern for each.

Gorillas are vegetarians and in a wild state eat a variety of plants, bulbs, roots and fruits. Ngagi consumes approximately 30 pounds of carrots, potatoes, apples, bananas, etc., a day. Like most other gorillas in captivity, he is also given about a pound of chopped raw meat as a substitute for the occasional rodent, lizard or other small animal which we suppose would be eaten in the wild.

Despite their tremendous strength, gorillas are inoffensive animals. Ordinarily they are so shy that observers find considerable difficulty in getting more than momentary glimpses of them in their native forests as they roam about in search of food.

They are social animals. Generally they are found in small family groups or bands. Each band is under the domination of an old male, the acknowledged leader of his several females, subadult youngsters of both sexes and babies. When danger threatens, the old male usually stages a covering demonstration of rage and a "Don't-come - any - closer - unless - you - want - to - be-torn-to-pieces" act while the rest of the band escapes to the forest. Actually, gorillas are lords of the forest; their great strength is respected and no other animals, man excepted, molest them.

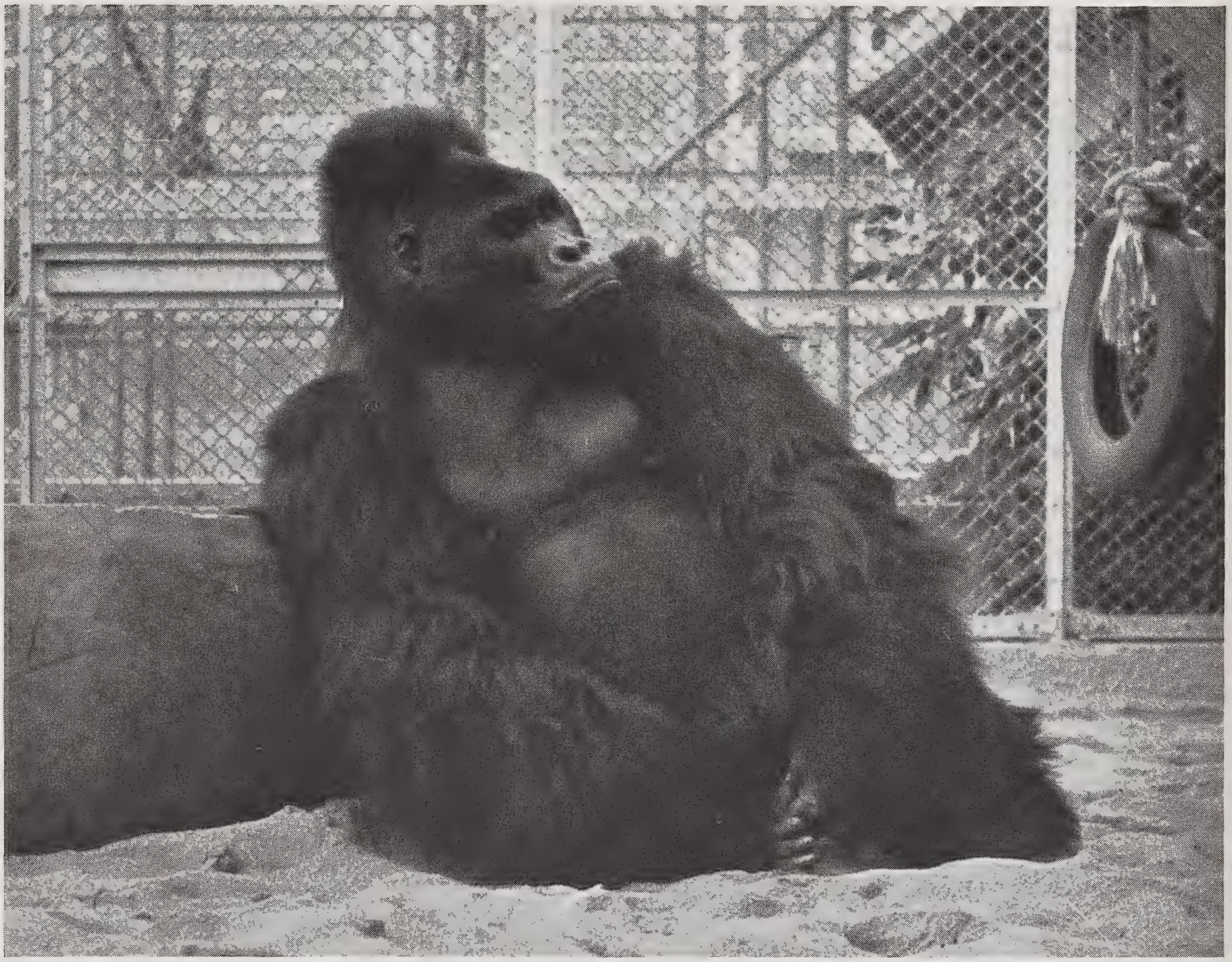
These roving gorilla bands spend the night wherever it overtakes them. They build sleeping nests of piled-up branches, sometimes in trees but usually on the ground. Next day the band moves on and the nests are never used again. Young gorillas are good climbers but adult males, probably because of their bulk, climb very seldom, if at all.

Zoo visitors will notice that gorillas are four-footed walkers, progressing in a stooped-over position with the body weight resting on the bent hands. This is their usual way of walking and thick callouses are worn on the knuckles. Young gorillas frequently walk erect in a very human fashion but habitually assume the stooped-over position as they grow older.

It is an interesting habit of gorillas to beat the chest or abdomen with their fists or hands. This is a means of expressing emotion and ranges from a rhythmic "stomach slapping," signifying happiness, to beating the chest in anger.

Gorillas when full grown are by far the largest of the three man-like apes—gorilla, orang-utan and chimpanzee. But the average zoo visitor easily confuses young gorillas with the chimpanzee and orang. The orang is readily disposed of by remembering that it has reddish-brown hair and yellowish-brown skin. The black-haired gorilla and chimpanzee are fairly similar but at any age the gorilla is the stockier animal and has relatively smaller ears.

Even experienced zoo men are awed by the stupendous size of the adult gorilla. The thick, stumpy legs support an enormous body with



Courtesy San Diego Zoo

The biggest Gorilla in any Zoo in the world is Ngagi, in the San Diego Zoo – 638 pounds. The high crest and the long hair on the arms are supposed to be characteristic of the mountain Gorilla. Despite his tremendous size, Ngagi is still comparatively gentle – although no keeper is able to enter his cage. This is a typical resting pose.

massive chest and tremendously developed forearms and hands. Fingers are short and thick, as big around as many a woman's wrist. All body measurements excel those of our largest and best-developed human beings and the strength of the gorilla is proportionally much greater, in fact unbelievably so.

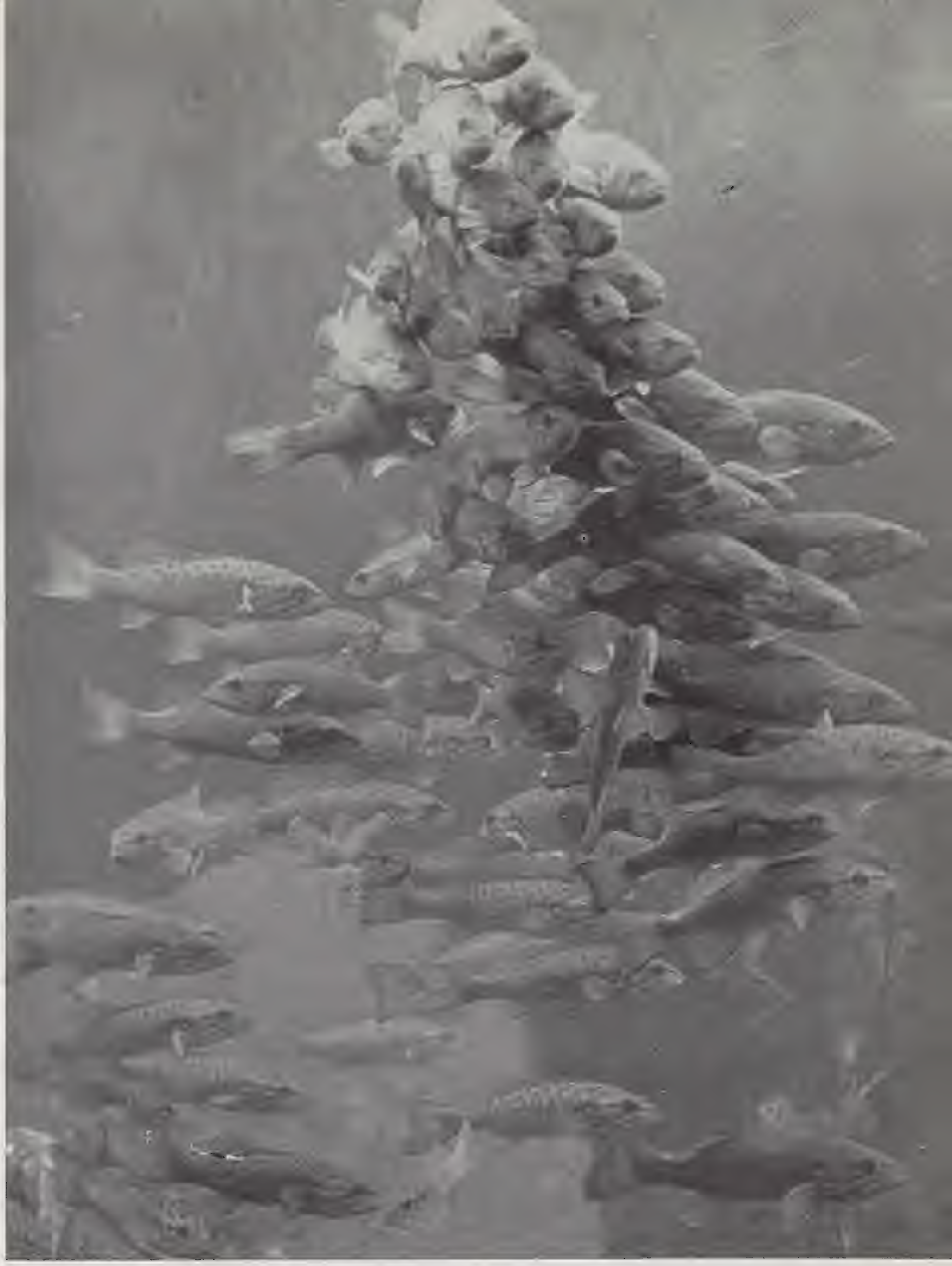
Few instances are recorded that give us an indication of this great strength. But in Mrs. Hoyt's "Toto and I,",[2] it is related how Toto could, with ease, move parked cars by shoving them around and that "Once when she seemed annoyed because the station wagon was in her way, she took it by the rear axle with one hand and, though the brakes were set, and the entrance to the garage had a slight incline outwards, yanked the car out and with a quick thrust of her arm dashed it forward again into the garage wall, smashing the headlights."

Gorillas are not common in their native territory and the methods used heretofore in capturing young animals for exhibition have almost without exception resulted in the death of at least one adult gorilla, usually the infant's mother, and upon one excuse or another native hunters necessarily used in these expeditions have all too often managed to exterminate entire bands.

Conservation measures are necessary to assure a supply of gorillas lasting into the future. Probably, like our own American bison, they are doomed to become extinct in a wild state. It might be that the gorillas now in our zoos will come to be the foundation stock that will save these animals for future generations.

[2] Hoyt, A. Maria, Toto and I. J. B. Lippincott Co., Philadelphia, 1941.

LL SET for winter. These mall-mouth Bass maintained he general form and relative osition of their aggregation ntil warmer water in the pringtime released them from he urge to cluster in a tight roup.

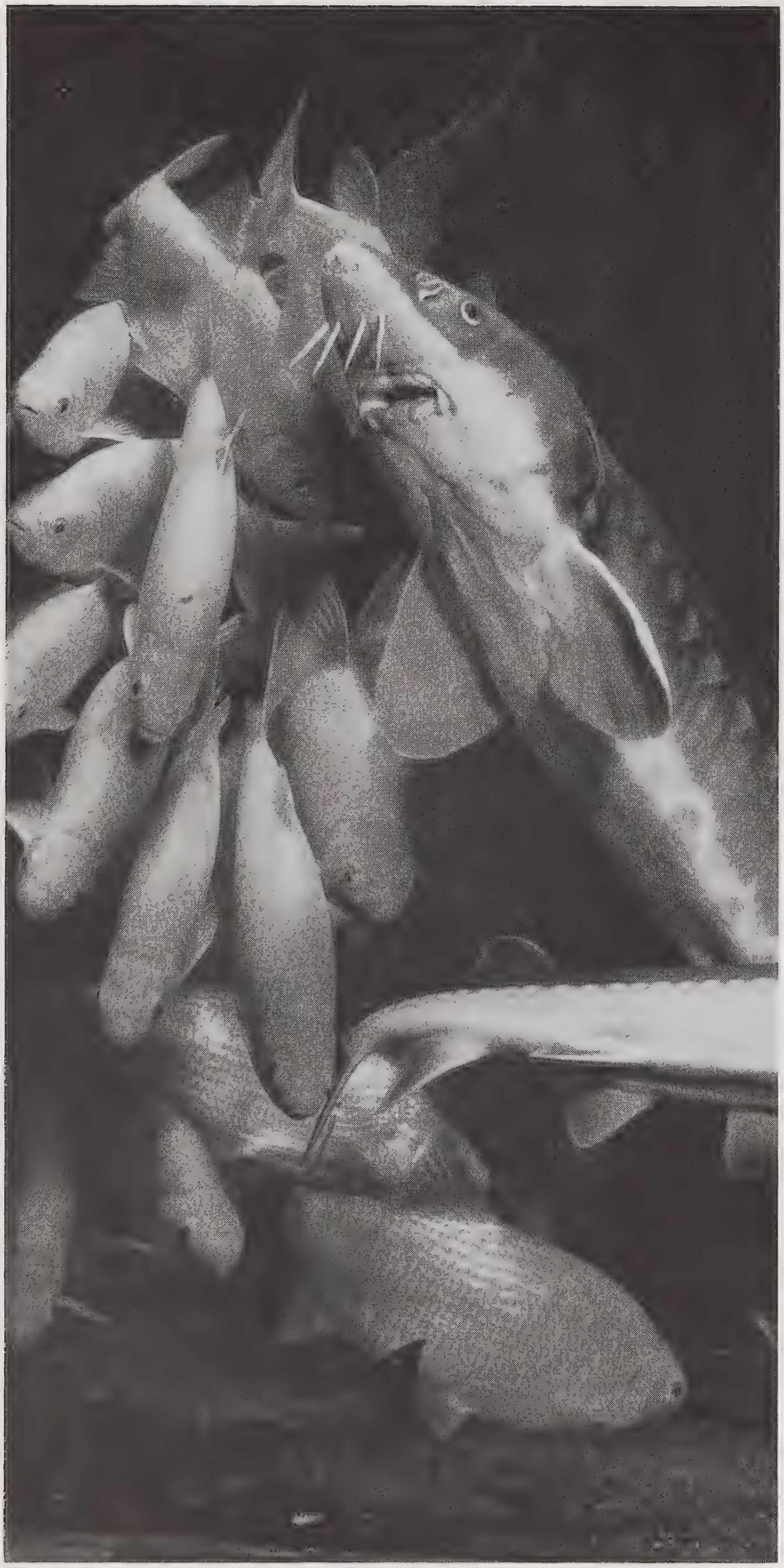


Winter Get-together

Fish Aggregations

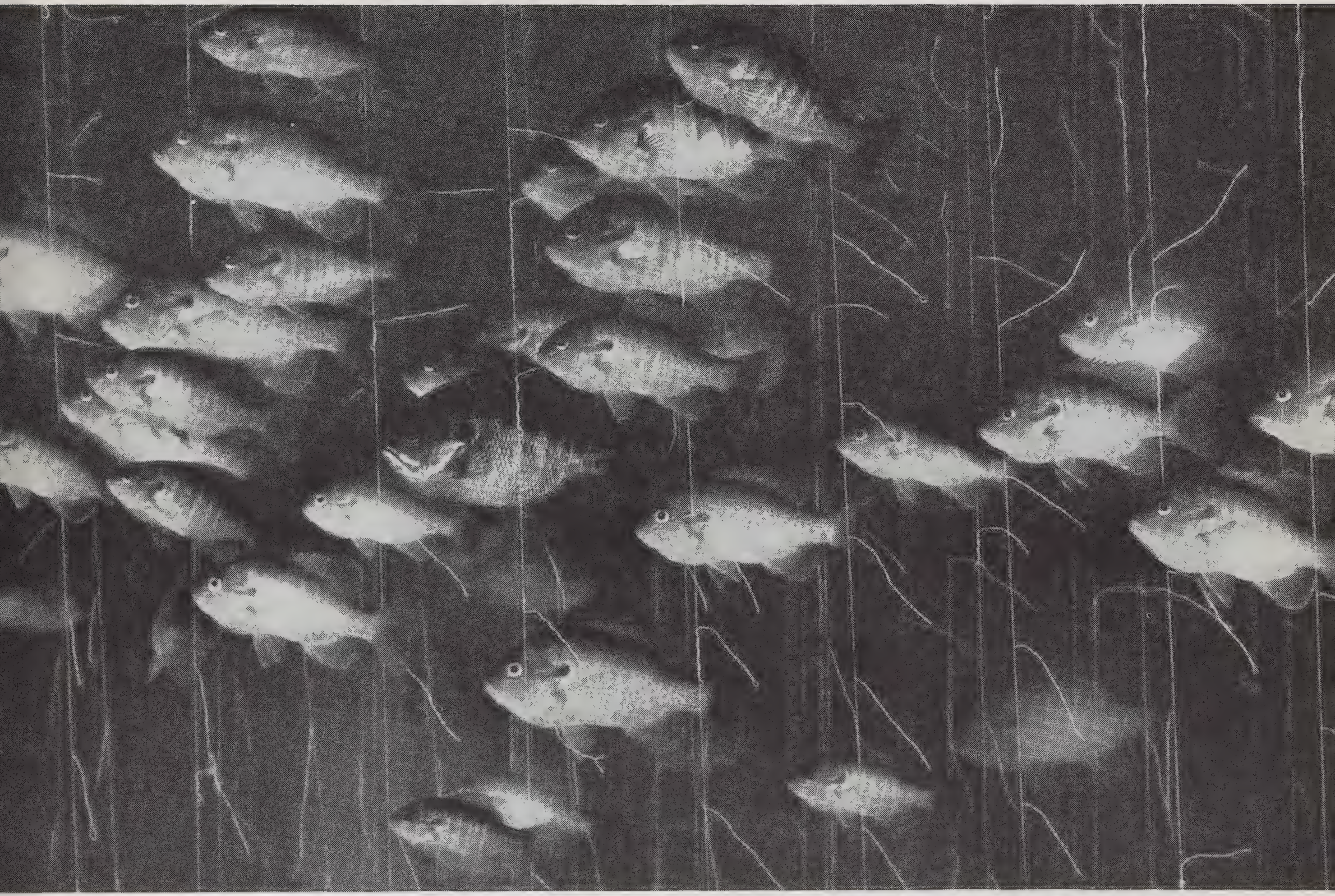
About this time of year, if one had the power to peer into the deeper holes of our northern fresh-water ponds and streams, many kinds of fish would be found at the beginning of their winter period of quiescence. In tight clusters or in looser but still cohesive groups, they have formed their winter aggregations and have begun to hibernate.

Not all northern fish hibernate—for example, the whitefish that is caught in large numbers through holes cut in ice. But many others give up the struggle to find food in ice-locked waters and are quickly chilled into inactivity. During this period their vital processes are reduced to a minimum and, in the Aquarium at least, they refuse food.



NO RULE – or, at any rate, no rule of fish behavior known to the Aquarium staff – was followed by these Golden Ides from central Europe when they formed the tight aggregation pictured on the left. Although they had gone through a normal hibernation the previous winter, they aggregated again in May and September following. Furthermore, they remained comparatively active and continued to feed. Why they did it, the Aquarium staff was never able to discover. Two sturgeons and two suckers which shared the tank with the Golden Ides, were greatly interested in the closely bunched fish and spent much time on the fringe of the aggregation.

In the days when the New York Aquarium occupied its quarters at the Battery, some of the fresh-water tanks were connected with the regular city water mains and consequently the temperature of the water rose and fell with the seasons. In late November or early December the temperature usually fell to the neighborhood of 40 degrees and the fishes that normally hibernated began to draw closer and closer together, and to discontinue feeding. The fish were generally in their typical winter aggregation by mid-December. If driven out of their grouping, the aggregation was reformed in an hour or two.



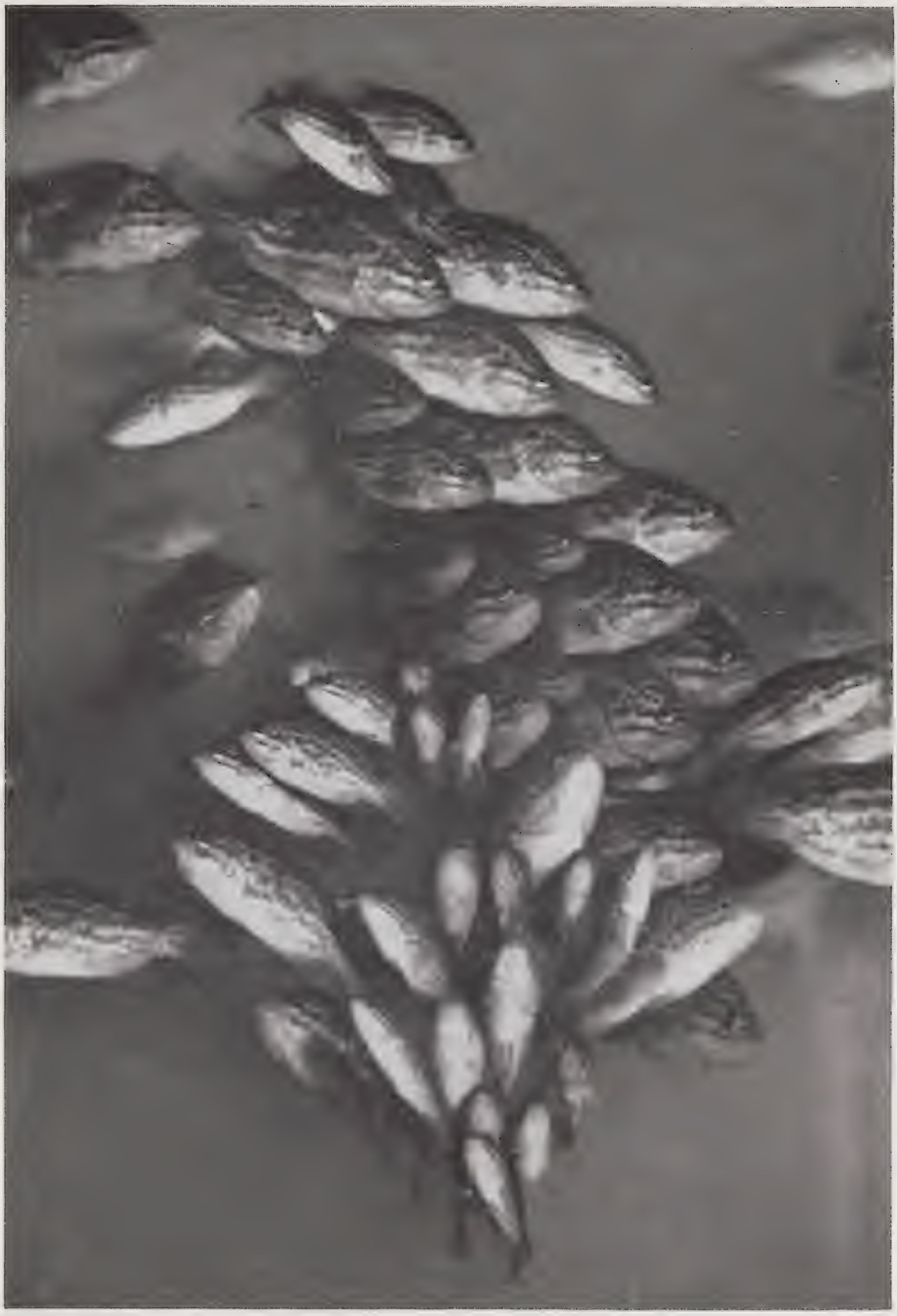
BLUEGILL SUNFISH demonstrate their winter aggregation in an experimental tank at the Aquarium. These fish were allowed to winter in a tank in which a series of strings were suspended to make visible the slight flow of the water. Hibernating fish head into flowing water, no matter how slight. In the background of this photograph, other fish can be seen faintly. Several of them are heading to the right, indicating that the current was flowing around the tank.

It is curious, but hibernating fish tend to keep the same relative position in the water all through the winter. The Bluegill Sunfish in the picture above were more or less held in position by the current in their tank so that in the late winter, at the end of their hibernation, they were scarcely a foot away from the position among the strings that they had assumed at the beginning of the winter.

In open streams, they may drift a few yards in the course of the winter. Occasionally at the Aquarium there were as many as three aggregations of the same kind of fish in one large tank, and invariably each kept its own position in relation to the others.

It is possible to keep normally hibernating fish from going into their winter rest period, simply by maintaining the temperature of the water at the summer level. Apparently they have their own, internal calendars — probably the shortening daylight — that tell them when it is time to hibernate, for if the water temperature is kept at summer height as the fall advances, the fish become sluggish and slow about eating. All through the winter they continue to eat, but with reduced appetite.

During the second winter of such treatment, their reluctance to forego hibernation has apparently been overcome, for they eat normally and move with their summertime activity. This elimination of the winter rest probably causes the fish to "live faster" and perhaps shortens their lives.

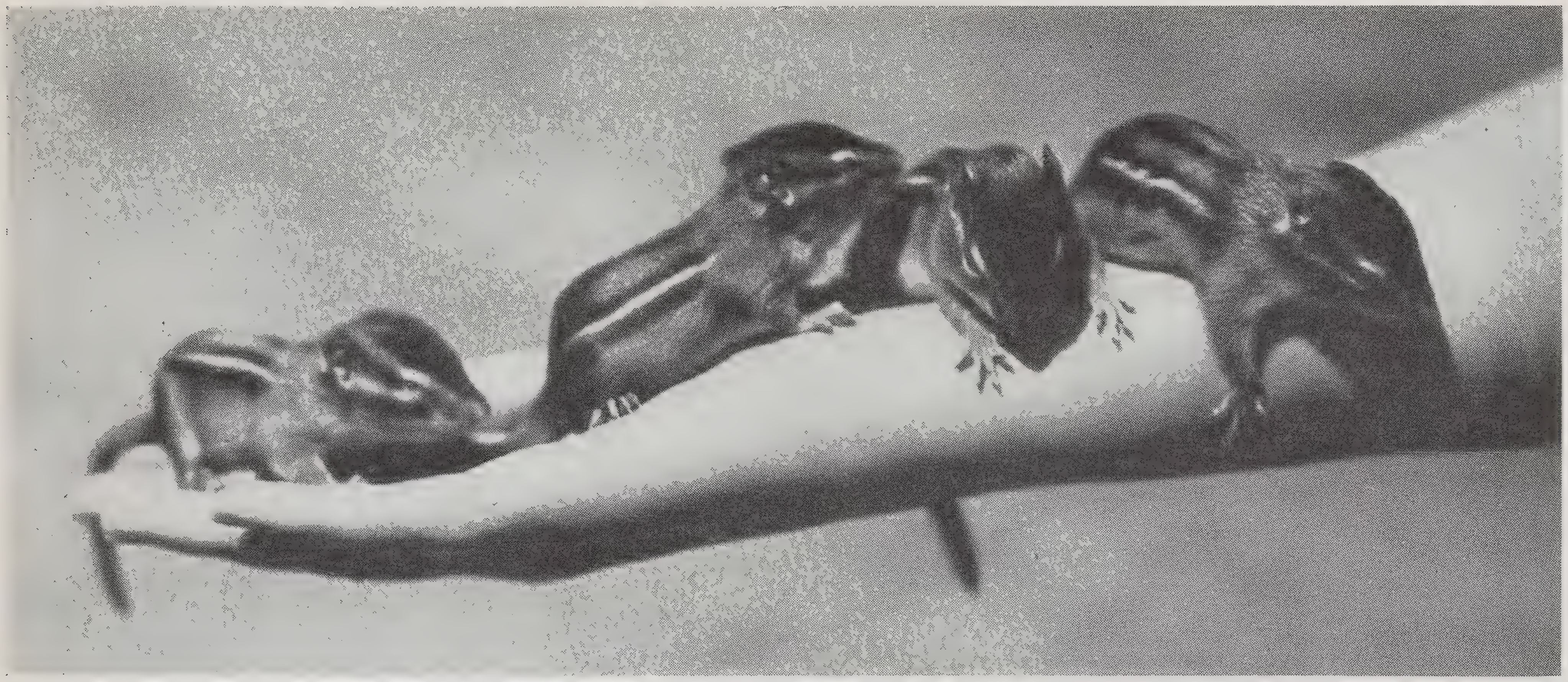


IN WATER that comes from more than one direction, an aggregation may twist and turn to face the sources of the streams, as these Mud Sunfish are doing.

When large collections of temperate freshwater fishes were kept at the Aquarium, the maintenance problem was simplified during the winter months by the fact that the greater part of the fishes were hibernating and did not have to be fed. Naturally, the Aquarium's food bills for this period were lower.

That fact used to cause eternal discussions with auditors of the Aquarium bills, who could not understand why the food requirements varied so much when the number of fishes to be fed stayed comparatively steady.

As a matter of fact, food requirements over a whole year would average about the same, whether fishes hibernated or not, for the hibernating species ate voraciously in the autumn to store up winter fat, and again in the spring when they came out of their torpor.



When they are about four weeks old, chipmunks can easily be tamed and it is then that they can become really good pets. Usually, though, they are still underground at this age. The eyes of these youngsters are opening.

Chipmunk Secrets

There Is Much that a Patient Investigator Can Learn About the Family Life of These Shy Creatures

ELSA G. ALLEN

Summer after summer the chipmunks had scampered around my door—friendly and tame enough to search my pockets for nuts but suspicious and shy when I stretched out a hand and asked for closer acquaintance. Family after family came to know they could always get a handout at the Allen's. We were running a veritable chipmunk farm but getting nothing out of it except the pleasure of feeding these darting, scurrying little creatures.

Their secretiveness was a challenge, as plain as if they had put it into words:

"All summer I have been living under your doorstep—and what do you know about me? I am here, and suddenly in the fall I am gone. You say I am hibernating. But did you ever see me when I am hibernating, or even where I hibernate?

"Have you ever seen me in my home, or even my home when I am not in it? People say I spend the winter in a hollow log. How would you like to live in a hollow log when the temperature drops below zero?

"You've never seen my children when they were really small, have you? Do you know they weigh so little that it takes ten newly born chipmunks to weigh an ounce? Of course you don't know that—and a lot of other things about me!"

There certainly was a lot I didn't know about chipmunks, but by means of trapping and marking and keeping wild chipmunks in captivity under various conditions I began slowly piecing together their life history. This is the story of some of my adventures with chipmunks.

* * *

Chip was sitting atop his favorite stump in the open, dry woods opposite my house on a fine fall morning when I started learning about him and his kind. As I scrambled up the bank, trap in hand, he sat there giving his *cuk-cuk* call, his sleek fur pulled closely over his little body, his tiny ears very round, his black eyes very bright and his little hands pressed against his breast. But as I drew dangerously close, he uttered a sharp note of alarm and dove into his burrow. There were better things to do in life than sitting in the sunshine staring at human beings; there was fall housecleaning, for one thing.

Perhaps you will frown on his way of cleaning house; it may remind you of that lazy maid you had, once upon a time, who swept the dirt under the rug. But Chip could never be called lazy. For weeks he had been rushing supplies into his burrow. Back and forth he went to the duck pond, passing by way of the pheasant cages, to stuff his cheek pouches with grain. In the woods he paused sometimes for acorns; then down he went through his tunnel to unload it all in his underground pantry. He never stopped to think that every one of those seeds would have to be shucked before it would be eaten. What quantities of litter and refuse to be taken care of!

But Chip had an ingenious way of cleaning house to make room for fresh supplies. When he built his home he hollowed out a long tunnel for the express purpose of holding the refuse from his nest. When the nest gets uncomfortably full of nutshells, seed covers and the like, he pushes out this loose material, shoves it along with his nose toward the refuse or midden tunnel, turns about and scratches it along the passageway. He makes the dirt fly between his hind legs; then he turns around again and tamps it in securely with his skillful, fast-working paws. This makes a dark vein in the ground and if you ever have the ambition to dig out a chipmunk nest you will know you are "getting warm" when you come to such a dark plug in the earth. Somewhere nearby are the chipmunk's living quarters.

Many chipmunks were caught out of the burrow where on that fall morning I set my trap, a large catch-them-alive rat trap with a trip door in the center. Thirteen in all were taken and kept in a large bird cage in the house. Later they were moved to a large outdoor room. Could they all be members of a family? I had read that they seemed to spend the sleeping months in family groups. Audubon himself thought this, but if mine were one family they certainly had no love for each other, for one by one they dwindled, done to death by the ruthless persecution of their fellows. This, I learned, was surely the way *not* to keep chipmunks. At last only two were left, a male and a female, so I gave them the run of a large open air room with half-inch wire netting over the windows and a cement floor, and waited for spring.

* * *

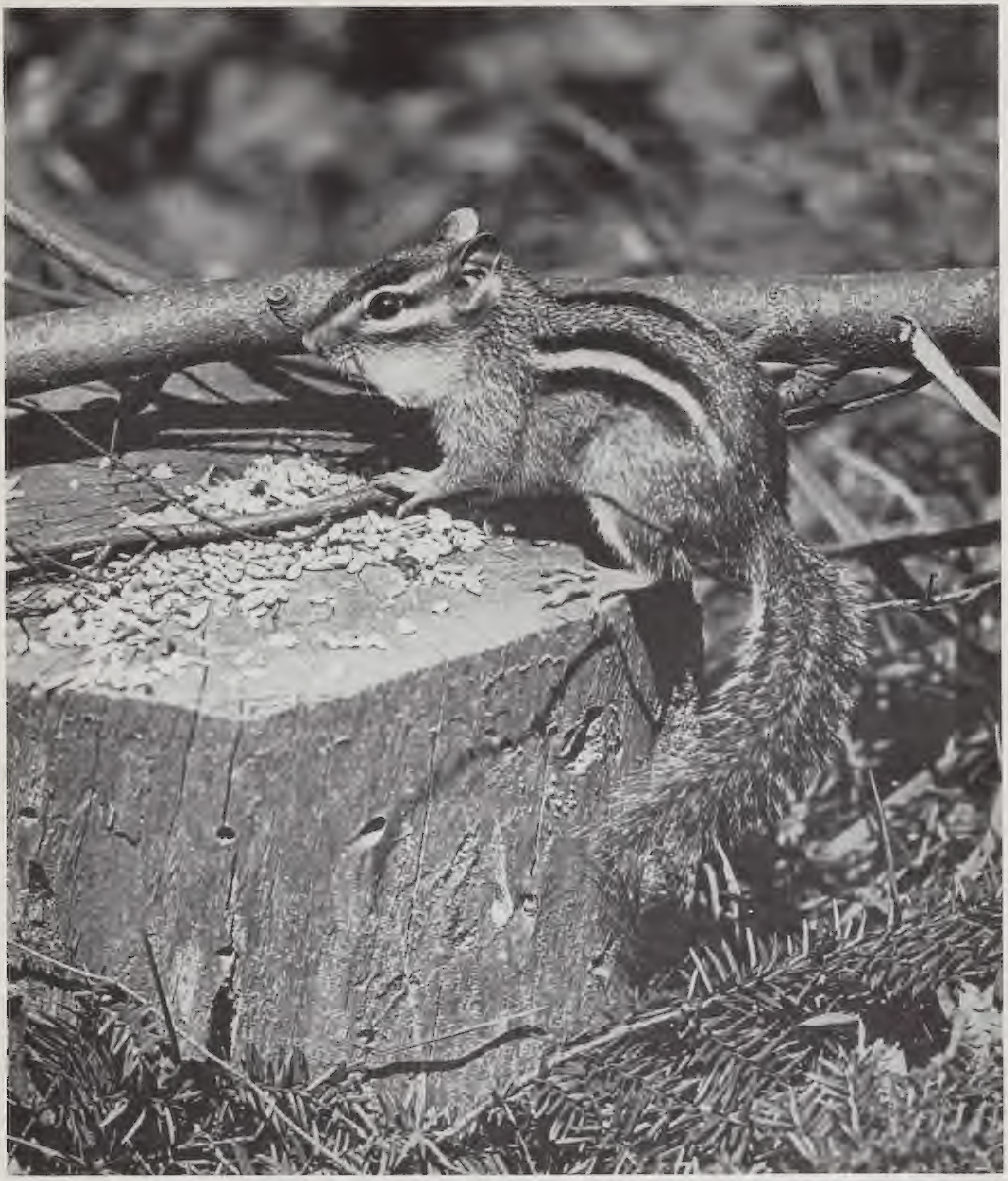
Finally the winter broke. It was April and scattering snow patches lay under the spruce hedge though woolly hepaticas already pushed up their tiny heads and opened blue-violet eyes among dead wet oak leaves. I had noticed a chipmunk going in and out of a certain hole in one of the pheasant cages as early as March 20 and then on March 31 I caught her in a rat trap, gave her a short haircut in the middle of her back and turned her loose under the prosaic name of Female No. 24. The cutting of hair was a device for identifying her among all the other marked wild chipmunks I was watching.

It was time for her to have young, I thought, but I did not catch her again until April 24 when she entered a trap I had set nearby in the hope of determining whether or not her mate was occupying the same burrow. But unfortunately a passing rat entered the trap shortly after she did, and killed her. On close examination it seemed she might already have young for her tiny mammae were slightly more conspicuous and the fur around them seemed pressed down as if by tiny paws.

I looked at the unanswering ground with its neat round hole and wondered what lay beneath it. Then I realized the chipmunk's lifeless little form could still yield her secret. Dissection showed that she had had her young very recently, as I suspected, and these helpless little mites were probably lying dead in the nest several feet underground.

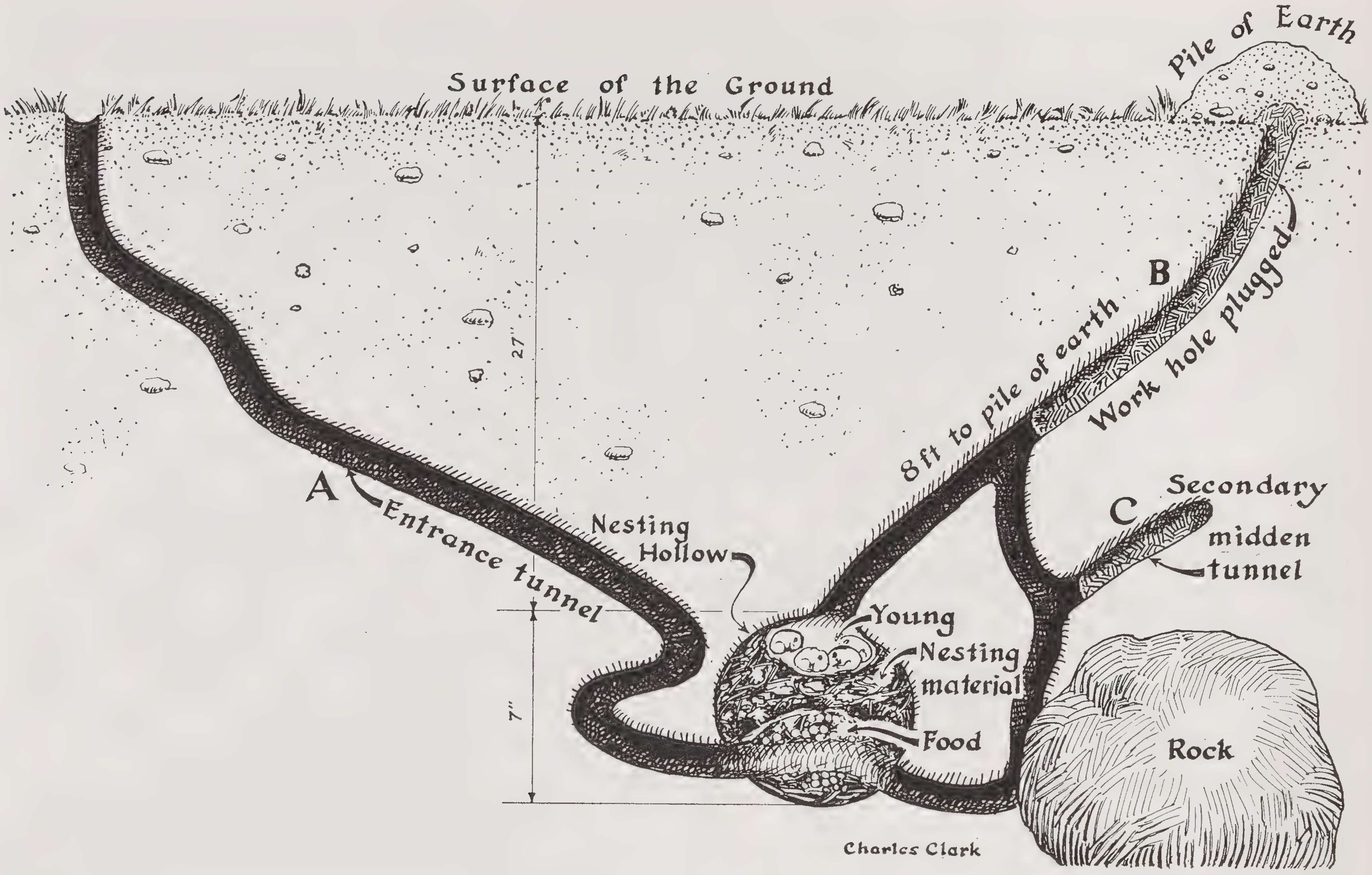
It was necessary to wait till the week-end before we had time to dig out the burrow. So two days later, on April 26, armed with pick and shovel, wires, rulers, notebooks and other paraphernalia, Doctor Allen and I undertook the job of finding the young.

The burrow was in a bank of light soil on the south side of the Glenside ravine. No effort had



Friendly – but secretive. Those three words reflect the character of the Eastern Chipmunk, *Tamias striatus lysteri.* This little fellow found a daily feast atop a stump near the Allen's home and in chipmunk fashion stuffed his cheek pouches and carried away great quantities of seeds and grain. The bulging of his cheeks is noticeable.

been made by the chipmunk to conceal the entrance, which lay inside a pheasant cage where there was scarcely a blade of grass to hide it. The calibre of the hole was 2 inches at the entrance, but at intervals during the digging the tunnel seemed to be narrower. It was difficult to be sure of this because the burrow constantly became plugged by the action of the shovel. The only way we could follow the tunnel was by means of a heavy, white, insulated wire held in the bur-



This is a diagrammatic section of the chipmunk burrow that Dr. and Mrs. Allen excavated. "A" is the entrance tunnel which the chipmunk uses for coming and going, and is constructed from the inside. "B" is the original tunnel, now mostly filled with shells of seeds. "C" is a supplementary chamber for the debris from the food supply.

row as far as it would go. We took careful note of all bends and turns and measured the number of inches in the direction in which it proceeded before turning again.

Roughly speaking, it was necessary to dig for eight feet, working down to a depth of about three feet, before any sign of a nest was found. The trend of the burrow was downward for two feet, with slight turns, then horizontal for eighteen inches. At a depth of two feet, the burrow still sloped downward for about twenty inches to a depth of twenty-eight inches below the surface.

Here it made a hairpin turn for a short distance, then sloped downward again, for from two to three feet it ran into a large rock, at the depth of thirty-four inches. By the time we had excavated to this point, we were very close to the nest—in fact we had bypassed it—but we did not realize it until we found one of the chipmunk's midden chambers filled with sunflower seed shells, cherry pits and miscellaneous débris. It appeared as a plug of dark loose material in the sandy yellow soil surrounding it, and proved to be the work tunnel leading up to a pile of earth under a small hemlock tree outside the pheasant cage.

The reason why there is no pile of earth near a chipmunk hole, where he is seen to enter it, has long been a mystery. The chipmunk is indeed a clever little beast, for after excavating his home he blocks the tunnel through which he has carried and shoved the earth, plugs it up, and then opens a new hole from within, many feet distant from the work hole. This then becomes the entrance tunnel. The discarded work tunnel, plugged for some inches with earth from within, is left as a repository for refuse from his nest.

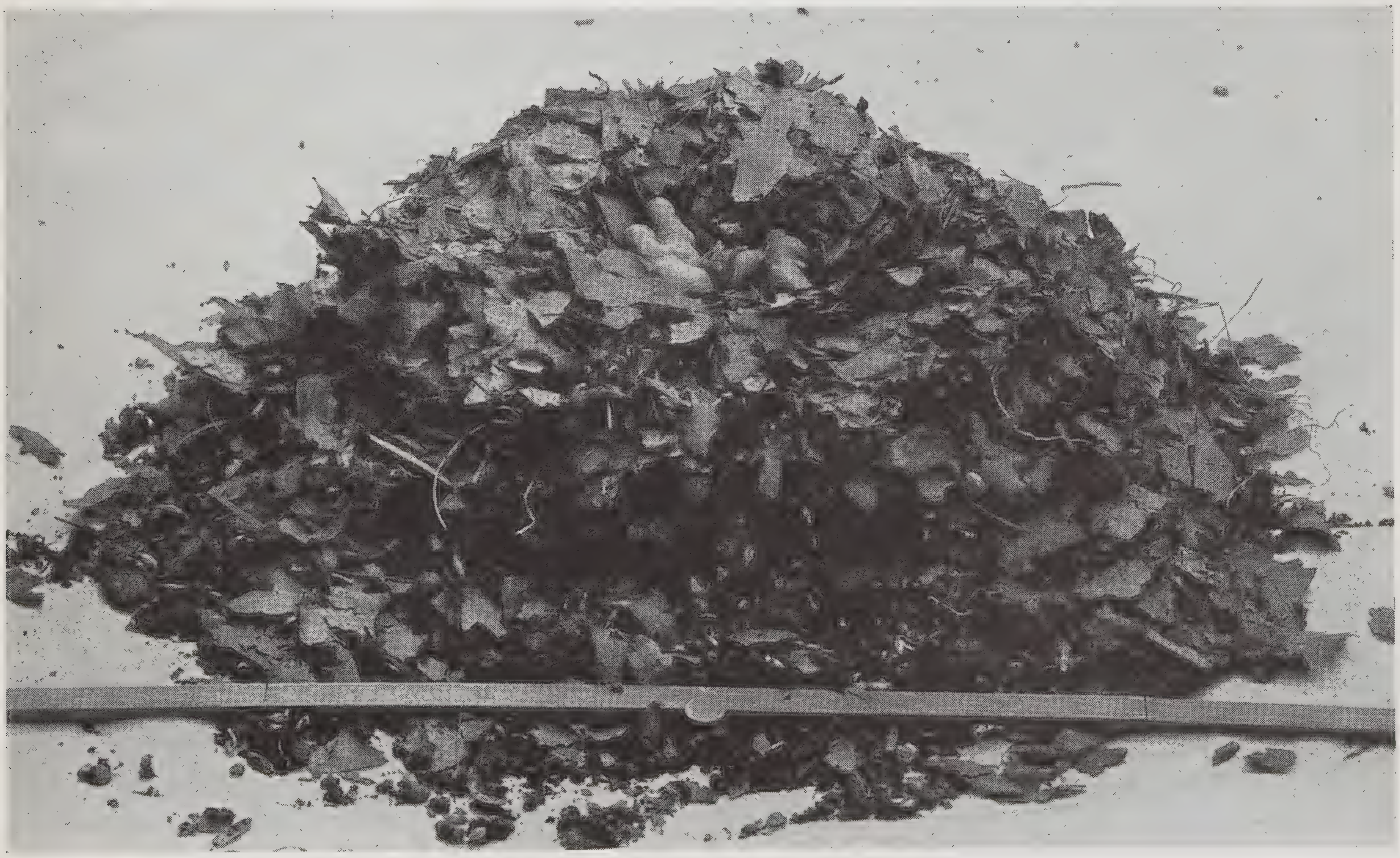
But to return to the entrance tunnel which we were following. This went behind the nest, thus causing us to miss the nest cavity. After running against the large rock, it led into the work tunnel below the point where the plugging ceased. A strip of open tunnel twenty inches long continued downward from this juncture of the two tunnels and opened into the nest cavity. Here we found a large, spherical hollow which seemed about a foot in diameter. We had to proceed with great caution for fear of injuring the young with tools, so, reaching with fingertips through the last part of the tunnel into the nest, I felt dead leaves and then some small, cold objects. Four such were taken out—four gray and cold baby chipmunks. Knowing that the mother had been dead for two days, we assumed that the young had died, but to our amazement they were feebly moving in my hands. They were hurried to the kitchen, fed with diluted milk from a dropper, and soon they became more lively. These little orphans did not last long, however; two died very soon after being brought in; the other two lived for two and a half days.

The nest presented several surprises. The hollow was somewhat more than a foot in diameter and contained about two quarts of grain such as we scattered for our wild ducks and pheasants. On top of the grain was a great pile of broken leaves — vastly more than one would suppose could be contained in the nesting cavity. Some accounts of the chipmunk's nest tell of grass being used as nesting material and mention several food storage chambers, but in this case the nest was made entirely of leaves and all the food lay on the bottom of the hollow.

The hollow and all it contained were clean and dry, with the pleasant pungent odor of the earth, but in pulling out the contents with my bare hands I was not a little horrified to find my arms alive with small, creeping creatures called pseudoscorpions. The nest contained literally thousands of these arachnids. It likewise contained many small black beetles, some mites and two stapholinids. It may be interesting to entomologists to learn that this nest, though destroyed as a chipmunk home, yielded two species new to science. A large flea, *Neopsylla striata,* was described by M. A. Stewart while samples of the pseudoscorpions finally got to Vienna where they were described by Max Beier as *Hesperochernes tamiae* sp. nov.

* * *

The male and female—survivors of the thirteen I had trapped out of one burrow—spent the winter in a large, open air enclosure with a cement floor. Thus the chipmunks could not burrow out, and the room being about thirty feet long,



An almost unbelievable amount of dry leaves is packed into the nest of a chipmunk. This shows the pile removed from one nest, with your newborn young. Mrs. Allen found the leaves "alive" with small, creeping creatures called pseudoscorpions. Two species from the nest — a flea and a pseudoscorpion—were found to be new to science.

Tiny as a chipmunk is, it seems to have an almost unlimited capacity for stuffing its cheeks with food. Here are thirty-two beechnuts removed from the cheek pouches of one chipmunk.

they had ample space and felt comparatively unconfined. The little mammals shared the room with about twenty wild-trapped ruffed grouse. Since these birds were full-winged it was unwise to enter the room often and consequently the chipmunks also were largely undisturbed, except on the few occasions when I trapped them to examine them for signs of breeding. Nesting boxes and plenty of food were provided and although the weather became very cold—sometimes sub-zero—they never showed any signs of hibernating but spent much of the time sitting over the wide open windows. On April 15 as the female climbed the wire netting it was obvious she was heavy with young. I immediately removed her mate, fearing that he might do violence to the young, and all but one of the grouse were removed on April 23. Thus Madame Chipmunk had everything her own way. A three-foot tunnel was added to her box and it seemed to please her; a fine nest of leaves, straw, paper and grouse feathers, firmly bedded on a good peck of feed, was in readiness. On April 30 her nest showed signs of some last minute preparations and on May 1 five young were discovered in a secondary depression near the top of the box.

Four youngsters in my own family successfully kept me from visiting the young chipmunks until May 3 at 6 P.M. They were already silky to the touch and showed faint stripes in the skin. Their heads were disproportionately large and mouselike and in a few days developed a covering of dense, reddish-brown, soft fur. Tiny white vibrissae were visible on the fifth day and the first sign of lower incisors appeared then as a tiny bump on the lower gum. These chipmunks were weighed and measured every few days for two months. The measurements of one at a week old were as follows:

Total length	77 mm.
Tail	25 mm.
Foot	13 mm.
Weight	12 gm.

Though completely helpless at this age, they were so active they could roll right off the weighing pan and they uttered faint squeaks which daily became stronger.

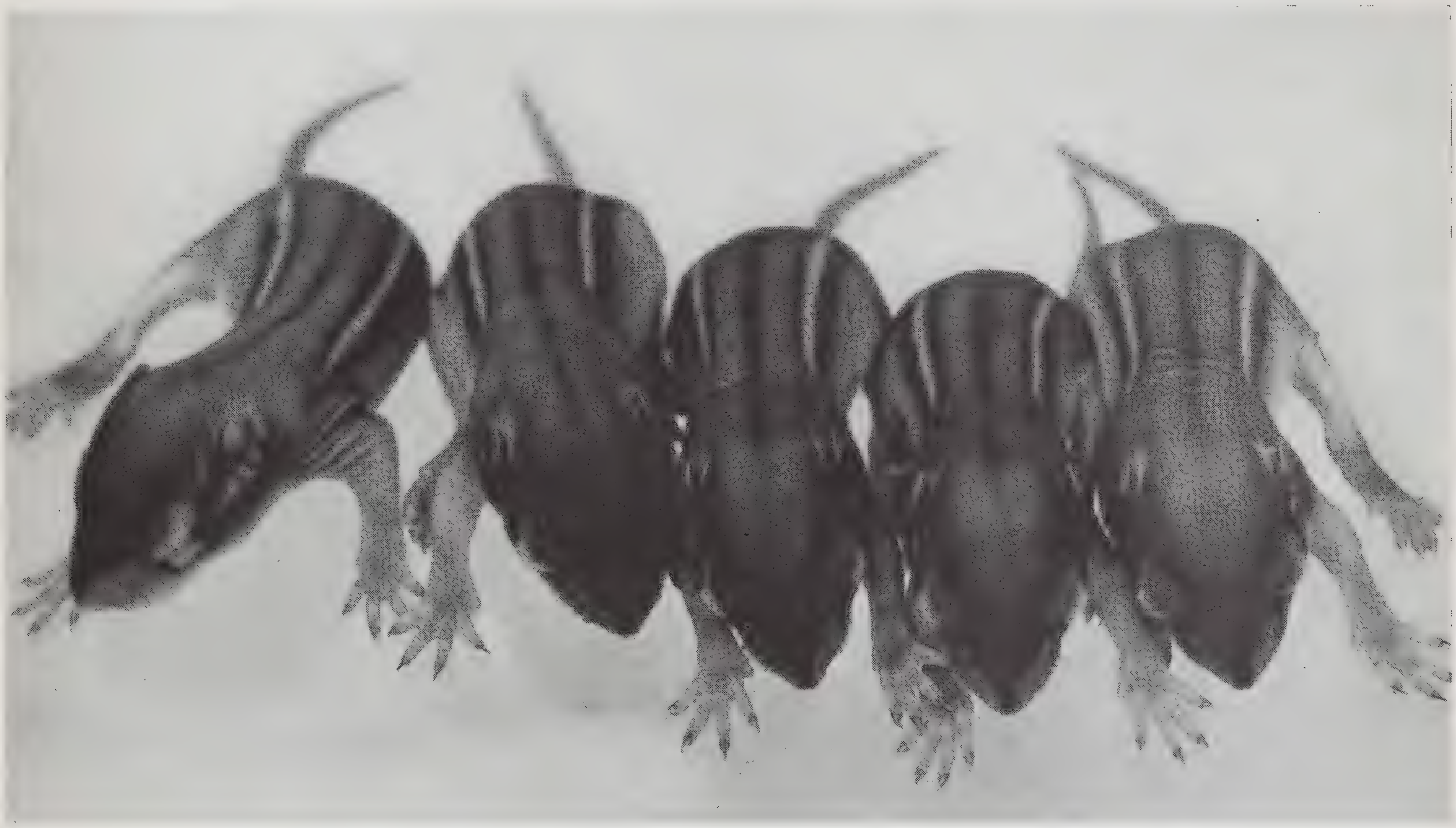
The mother stayed with them almost constantly until May 8 when she began spending quite a little time out of the nest. On June 14, when the young were about six weeks old, two of them were found to be using another box in which they had built a loose nest, but at dusk all were in the home nest with the mother.

Since these were apparently the first chipmunks ever raised in captivity, the mother seemed to me too valuable to be allowed to settle down. There was much, much more to be learned about chipmunks. Therefore, the young were given a large cage of their own on July 3 so that she could proceed as normally as possible with her captive life. She was given an adult male companion on July 7 in the hope that she would breed again that summer, but unfortunately he escaped on July 9 through a hole caused by heavy rain.

This mother chipmunk spent her second winter in the open air room, again without hibernating, and maintained the good weight of 92 gm. In March she mated with a wild-trapped male and on April 18, early in the morning, she gave birth to six young—two males, and four females. The period of gestation was 31 days. From these young it was possible to obtain exact information on the development of the teeth[1] and many other notes on their growth and behavior which were not obtained from the first litter.

When the babies were three weeks old I put two of them in a small bathtub — something smooth being necessary to prevent them from climbing out. Although their eyes were not yet open, they ran around inquisitively and tried to sit up and wash their faces. They were still too weak, however, and fell over every time despite their persistent efforts.

Their eyes did not begin to open until the thirtieth day. It is at this very young age of about a month that they can be really tamed, but since they are normally underground at this time, few persons ever have the opportunity to attempt it. Bread soaked in milk is eagerly accepted and on this and other soft foods they grow rapidly and soon are gathering food in their pouches, like adults. I found that it is well to keep them somewhat hungry and that, unless they are handled considerably, they develop their inherent wildness. One chipmunk that we found when it was about a month old became completely tame, went freely in and out of the house and built a nest in an empty drawer in the study. Every night after it had gone to sleep the children picked it up and said goodnight to it!



The first family of chipmunks born in captivity. When they were only a week old, they were about 3 inches long and weighed a little less than half an ounce each. Here they are shown at the age of about two weeks. Their eyes are not yet open and they are still virtually helpless, but active and much inclined to utter baby squeaks.

* * *

The hibernation of the chipmunk is a phase of its life history that is difficult to understand, because it is so variable. Many experiments were carried out with captive animals, living under different conditions of temperature and light, in an effort to learn the controlling factors of this peculiar dormant life that chipmunks indulge in. I kept one in a glass cage in the kitchen during the winter so that her activities could be photographed. In this warm room temperature she never went into a completely torpid state, although she slept a great deal, ate and moved about with her eyes closed and was not in the least disturbed by strong light, voices or other noise.

---

[1] Allen, Elsa G. Habits and Life History of the Eastern Chipmunk. *N. Y. State Mus. Bull. No. 314,* pp. 52-53. 1938.

Other chipmunks I kept in small cages in a dark, cool, damp room in the cellar, and these showed an increased tendency to hibernate. These animals were not allowed to have food in their cages, although they were fed from time to time. No. Eighteen, a wild female, spent a large part of the month of February in a heavy torpor, curled up in her cage. When picked up she could be rolled around like a ball without uncurling herself. In this state of hibernation the body temperature is much reduced, the animal becomes stiff and physiological functions are arrested for days and perhaps weeks. When rousing from hibernation the chipmunk trembles violently and may stagger or even roll completely over in a stiff, semi-curled-up position before waking. Unlike its dull cousin, the woodchuck, which sleeps profoundly all winter, the sprightly chipmunk frequently interrupts its hibernation to feast from its nest full of supplies, and in an open winter may even venture out of its burrow in late November. One hardy little steward was so captivated by the feed I put out for him that he gathered it daily until noon during November, despite the fact that snow lay on the ground and the temperature at twelve o'clock was 22° and only 18° in the morning when he began storing. On November 29, fresh snow and a chill wind sent him back to his cozy underground retreat with empty pouches.

And so, out of these and a great many other experiences with chipmunks, I have gained a few answers to the riddles that "Chip" propounds to me as he sits atop his favorite stump and cries *cuk-cuk* to tease me.

In order to observe a chipmunk in its winter sleep, Mrs. Allen supplied one with a comfortable nest in a glass cage in her kitchen, and this shows the little animal in a typical hibernating position in its bed of seeds and shells. At room temperature the chipmunk did not go into a completely torpid state, but it slept a great deal.

BEHIND THE SCENES

NEWS AND NOTES OF THE ZOOLOGICAL PARK, THE AQUARIUM AND THE DEPARTMENT OF TROPICAL RESEARCH

THE GIRAFFE HAS A VOICE

The much-discussed and often debated question whether the giraffe has a voice is now settled as far as the staff of the Zoological Park is concerned. It does.

Late in October our female Reticulated Giraffe lay down in her stall in the Antelope House and subsequently was unable to rise. Veterinarian Goss inspected the animal and found it necessary to change her position to relieve the pressure of her body on her forelegs. As he did so, the giraffe uttered a loud, drawn-out "Mooooo." It was uttered only once—not repeated.

For the record: The Bronx Zoo's Reticulated Giraffe, *Giraffa camelopardalis reticulata,* positively uttered the sound "Mooooo" at 9:50 A.M. on October 25, 1943. Witness: Dr. Leonard J. Goss, D.V.M.!

As a matter of fact, it has been asserted by former Veterinarians in the Zoological Park that the giraffe was capable of making a sound, even though the animal does not possess vocal cords. For some years a section of a giraffe's throat, showing the cord-less larynx, was on exhibit in the anatomical museum of the Animal Hospital. Other Veterinarians agreed that the sound could not be modulated, but it is impossible now to determine whether they were speaking from theory or from experience. In any event, Dr. Goss is able to settle the matter.

NEW MEMBERS OF THE SOCIETY

New members of the New York Zoological Society since the last issue of this magazine are the following:

Annual

Baron de Zaylen
Luke Flanagan
Mrs. Jennie Lynne Kyle
William Lynch
Henrietta L. Seimers
John E. Tarrant
Mrs. Holland Thompson
John Wolff, Jr.

Junior

Joseph Sonnenfeld

IMPROVED EXHIBITS

Improvement of the interior of the Small Mammal House has been in progress for some time and the building was reopened late in November. A glass screen has been set in front of a battery of compartments for the smaller monkeys to protect them from the coughs and sneezes of the public, and the Clawless Otters have been given a habitat cage, with a deep tank so arranged that they can be seen swimming under water.

SUMMER'S END

After a most successful summer, the Farm-in-the-Zoo and the Children's Zoo closed for the winter on November 15.

Somewhat isolated as it is, and in this war-time summer visited by very few persons in automobiles, the Farm-in-the-Zoo nevertheless had the extraordinarily large number of 88,000 paid admissions. Test counts made during the summer indicate that an additional 40,000 service men and children were admitted free.

There were approximately 160,000 visitors to the Children's Zoo.

SERVICE MEN'S PETS

Starting in a small way, but with the prospect of enlarging the exhibit, we are making a special display of pet animals brought home by men in the armed services.

The collection already contains a Brown Lemur from Madagascar which a soldier bought in North Africa, a pair of Flying Phalangers from New Guinea which a member of the Pacific Armed Guard received as a present from a native, and a very young Margay cat brought back from Brazil by a sailor.

Not quite so exotic, but nevertheless included because they make an excellent exhibition pair, are two tame woodchucks that one young man had to dispose of when he was called into the Army.

Insofar as possible, the animals will be exhibited in the Small Mammal House, with special labels telling how they were acquired.

* * *

Two White-breasted Doves were hatched in the Bird House in late October, in the habitat cage known as the South American Jungle

Stream. They were the first of this rare Jamaican form we have managed to rear, although once or twice before the dove produced eggs.

PUBLICATIONS OF INTEREST

TAXIDERMY. By Leon L. Pray. The Macmillan Co., N. Y., 1943. 91 pp., 42 illus., $1.49.

Many of our best known naturalists first came into their chosen field through an early interest in the art of taxidermy. Thirty-five or forty years ago practically no information on this subject was available in published form. Many farm boys (this reviewer included) purchased a correspondence course in taxidermy, and birds and other animals were then mounted which still serve as somewhat nostalgic reminders of youthful days afield.

The author of TAXIDERMY has been a practical, working taxidermist through all the recent years which saw the modernization of this art. He worked and studied under Carl Akeley. The present wide use of borax instead of the poisonous arsenic for insect proofing is largely due to his research and advocacy.

Almost everyone engaged in Zoology or any of its allied studies must have a practical knowledge of taxidermy. For all such persons and for the hunter and the fisherman who want to preserve their trophies, Leon Pray's TAXIDERMY gives full and complete directions for mounting various types of animals.

To those of us who are frequently called upon for information concerning taxidermy, this little book is extremely welcome.—*C. W. Leister.*

THE BIRDS OF AMERICA. By John James Audubon. With a Foreword and descriptive captions by William Vogt. The Macmillan Co., New York, 1941. $4.95.

So many volumes have been written on the life and works of John James Audubon, and so widespread has been the destruction of his magnificent elephant folios for decorative purposes, that the fame of the great naturalist has been raised to the status of that of a national hero. Reproduction of the plates of birds in the now scarce and very valuable elephant folios would appear to be a logical sequence. However, an undertaking of such magnitude must have been approached with some trepidation, since the work would be both difficult and expensive. Public support of such a venture must always be a doubtful quantity but in this case, at least, the publishers' confidence in the general interest in birds appears to have been justified. First printed in 1937, at $12.50, a new edition is now off the press at the surprisingly low price of $4.95, a further indication of the success of the venture.

Appreciation of the difficulties involved in this undertaking must be based on the realization that the total of 435 full page color plates, originally contained in five unwieldy volumes, each measuring approximately 27½ x 39 inches, has now been condensed into a single volume of 9½ x 12½ inches. In addition to the illustration, each page carries a brief paragraph of salient facts relating to the bird figured, excellently done by William Vogt.

Any criticism of the reproduction of these plates must take into consideration the fact that the color in the original publication was applied by hand, so that there must be some variation in the many copies. While it is true that the color of some of the plates does not check well against that of the original set in the Zoological Society's library, it is still possible that it might be closer to others. Even though this disparity may sometimes be quite evident, the critic may be in some danger of appearing captious, for taken by and large, this volume is a magnificent achievement. — L. S. Crandall.

INDEX

Figures in **black type** indicate that the reference is, or includes, an illustration, map or diagram.

A

Allen, Elsa G., "Chipmunk Secrets," 133-140
Anoa, 64, 70
Anoa depressicornis, 70
Anoptichthys jordani, 82
Aquarium, New York, 129-132
Astyanax mexicanus, 82
Atz, James W., book review, "Voles, Mice and Lemmings," 24
Aurochs, 65

B

Baboon, Hamadryas, **38**
Baird Court, **47**
"Bamboo," Gorilla, 125

Banting, 43, 69
Bass, Small-mouth, **129**
Bathysphere, 71
Bats, Vampire, 45
Bear, Alaska Brown, 79, **80**
  Black, 75, **76, 77,** 78
  Grizzly, **78,** 79
  Peninsula Giant, **80**
  Polar, **74,** 81
Bears, 74-82
Beebe, Dr. William, 23, **26,** 46
  "Cashing Jungle Dividends," 26-30
  "Apothéosis of the Zoo," 50-55
  "Bathysphere Goes to War," 71
  "Our Zoo's Former Inhabitants," 111-116
  book review, "Extinct and Vanishing Mammals of the Western Hemisphere," 120
Beier, Max, 137
Bellbird, Three-pronged, 10
Benchley, Mrs. Belle J., 118
Bibos gaurus, 69
  sondaicus, 69
Birds, helping baby, 56-58
Bison bonasus, **67**
Bison, European, **67**
  Wood, **112,** 113, 114
Bluejay, **57**
Bongo, 15, **16**
Bos (Bibos) sauveli, 43, 69
  indicus, **65**
  longifrons, 65
  namadicus, 65
  primigenius, 65
  taurus, 65
Breder, Dr. C. M., Jr., 82, 87, **88**-90
Bridges, William, 16
  "Newest Animal—the Kouprey," 43-44
  "Longevity of Bats," 45
  book review, "The Birds of Britain," 48
  "Alas, Poor Annie!" 58
  "What We Have Learned About Blind Cave Fish," 82, 87-90
Bubalis bubalis, 70
Buffalo, Cape, 70
  Indian, 70
  pygmy, 70
  water, 70
Bush Baby, **98,** 99, 100, **101,** 102, **103**
"Bushman," Gorilla, **124,** 125
Butterflyfish, **13**

C

Cady, Harrison, 55
Carriker, M. A., Jr., 3
Cattle, Ancestors of Domestic, 63-70
  Chillingham, 66
  wild, 63-70
Cavy, Patagonian, born, 71, 117
Cephalopterus ornatus glabricollis, **2**-10, 104
Children's Zoo, 72
  attendance, at 141
Chimpanzee, **110**
Chipmunk, Eastern, 133-140
Cincinnati Zoo, 125
Clark, H. Huber, 72
"Comet" Platyfish, **19**
Coope, Robert, 47
Cordier, Charles, 1
  "The Umbrella Bird Comes to the Zoo," 2-10
  "Quetzals *Do* Breed in Captivity," 104-106
Crabs, Fiddler, 30-34
Crandall, Lee S., 21, 46
  "It's a Duck Winter," 21
  "Homing Pigeons in Peace and War," 39-42
  "Red Flamingoes," 46
  book review, "Trail of the Money Bird," 48
  "Ten Ways of Helping Baby Birds," 56-58
  book review, "Birds and Man," 72
  "Black Babies," 117
  "Barn Swallows in the Zoo," 118
  book review, "Meeting the Mammals," 120
    "The Birds of America," 142
Crane, Jocelyn, "Cashing Jungle Dividends," 30-34
Crane, White-necked, nesting, 71
  chick, 96

D

Davall, Grace, 73
Delacour, Capt. Jean, 43
Desmodus rotundus murinus, 45
  rotundus rotundus, 45
Dictionary, Farm, 71
"Dinah," Gorilla, 125
Dinia mena, **31**
Ditmars, Dr. R. L., 21
Dove, White-breasted, 141
Drill, **37**
Du Chaillu, Paul, 123
Ducks, in Zoo, 21, 45
Dunton, Sam, 49, 73, 91

E

Edmond-Blanc, François, 44
Eel, Electric, **12**
Eisendrath, David B., Jr., 9, 41
Eldridge, Harry, 23
Elephant, Alice, death of, 117
Exhibits, special, 46

F

Farm-in-the-Zoo, 45, 63, 71, 73, 97
  attendance at, 141
Fireflies, 91-95
  larva, **93**
  pupa, **93**
Firefly, Burning, 92
  Double-flash, 92
  Flashing, 92, **93**
  Glowing, 92
  Green-lighted, **Cover No. 4,** 91, **92, 95**
Fish Aggregations, **129-132**
Fish, Blind Cave, 82, 87-90
  experimental tanks, **88**
  newly discovered, 90
Flamingoes, 118, **119**
  effects of diet, 46
Fleming, Henry, **26,** 73
  "Lightning-bugs," 91-95
  book review, "Picture Book of Insects," 96
    "The Grasshopper Book," 120

G

Galago, **98,** 99, 100, **101,** 102, **103**
Galago senegalensis moholi, 98-103
"Gargantua," Gorilla, 127
Gaur, 43, 68, **70**
Gayal, **69**
Giraffa camelopardalis reticulata, 141
Giraffe, voice of, 141
Goldfish, Aquarium derivative, **12**
Goose, Barnacle, nesting, 96
  Hutchins X Pink-footed, nesting, 96
Gordon, Myron, "Black Lace for the Gold Platyfish," 18-20
Gorilla, 46, **72, 107**
  Bronx Zoo's, **122,** 123-128
  young, **62**
Gorilla gorilla gorilla, 125
  gorilla berengei, 125
Goss, Dr. Leonard J., 1, 45, 141
Gresser, Dr. E. B., 87
Guereza, **85**
Guggenheim, John Simon Memorial Foundation, 18

H

Hesperochernes tamiae, 137
Hippopotamus, birthday of, 96
Holstein-Friesian, **64**
Hoyt, A. Maria, 128
Hummingbird, Costa Rican Firethroat, **9**

I

Ide, Golden, **130**
Insect, False-face, from Venezuela, **Cover No. 2**

J

"Janet Penserosa," Gorilla, 125
Johnston, Sir Harry, 43

Jungle, Venezuelan, **28**
  "river taxi," **34**

K

Kane, Joseph, 45
Kerry, Irish, 66
Kirkpatrick, G. E., 118
Klipspringer, 22
Kouprey, 43, **44**, 69

L

Lang, Herbert, 15
Leister, Dr. C. W., 21, 97
  "Pride of the Antelope House," 15-18
  "Young Animals," 22-23
  "Before Montefiore Joash Sunshine," 63-70
  "Two Healthy Baby Gorillas," 123-128
  book review, "Taxidermy," 142
Lemur, Brown, 141
Leopard, Black, born, 117
Liers, Emil, 117
"Lightning-bugs," 91-95
Lincoln Park Zoo, 124, 125
Llama, **Cover No. 6**
Longhorn, Texas, 63
Lungfish, African, **12**

M

"Makoko," Gorilla, **122**, 123, 127
Mandrill, **36**
Marcy, Donald, 21
  "Bears and Their Curious Ways," 74-82
  "Night Life of the Bush Baby," 98-103
Margay, 141
"Massa," Gorilla, 125, **126**
"Mbongo," Gorilla, 125
Meader, Dr. Ralph, 89
Merriman, Dr. Daniel, 89
Monitor, Komodo, 43
Monkey, Japanese Red-faced, **61**
  Owl, **108**
  Rhesus, **86**
  Spider, **59**
  Squirrel, **83**
Moray, **14**
Moth, Tropical, **31**
  Urania, 34, **opposite 34**
Mudspringer, **13**
Muskox, 67

N

Neopsylla striata, 137
"Ngagi," Gorilla, 125, 127, **128**

O

"Oka," Gorilla, **122**, 123, 127
Okapi, 15, **17**, 43
Orang-utan, **35**
Orchid, White, 34, **opposite 34**
Osborn, Fairfield, 23
  "Goals," 1
  "In the Mail," 25
  "The Cartoonists' Gorilla," 49
  "New Ways to Old Ends," 73
  "Reversing the Order," 97
  "The Pacific World," 121
Otter, **Cover No. 3**, 117
  Clawless, 141
Ovibos moschatus, 67
Ox, European, 65

P

Panterpe insignis, **9**
Penguin, "Annie," **58**, 73
Phalanger, Flying, 141
Pharomachrus mocinno costaricensis, **5**, 104-106
Philadelphia Zoo, 125, 126
Photinus consanguineus, 92
  marginellus, 92
  pyralis, 92, **93**
  scintillans, 92
Photurus pennsylvanica, **92, 95**
Pigeons, "Carrier," 39-42
  Homing, 39-42
Platyfish, "Comet," **19**
  Gold, **19**
  Golden Wagtail, 18, **19, 20**
Platypoecilus maculatus, 19
Poephagus grunniens, **68**
Primates, Portraits of Four, **35-38, 59-62, 83-86, 107-110**
Pseudoscorpion, 137
Puma, **115**, 116

Q

Quetzal, Costa Rican, 3, **5**, 104, **105**, 106
  Honduran, nest, **105**

R

Rasquin, Priscilla, 89
Ray, Cow-nosed, **14**
Red Cross, workshop in Zoo, **22**
Reilly, Keeper, **72**
Reindeer, **114**, 115
Rhesus, **86**
Ringling Bros. Circus, 127
Rizzi, Frank, 1, 117
Rocking Stone, **55**
Roosevelt, Col. Theodore, 21

S

San Diego Zoo, 118, 125, 128
Sanborn, Elwin R., 74
Sapajou, White-throated, **109**
  woolly, **60**
Sasse, Arthur, 47
Scorpionfish, **11**
Seahorse, **14**
Service Men's Zoo, 141
Shark Sucker, **12**
Shorthorn, Celtic, 65
Simonson, S. Carleton, 46
Small Mammal House, Improvement of, 141
Snake, Coral, 1
Stewart, A. M., 137
Sucker, Shark, **12**
Sunfish, Bluegill, **131**
  Mud, **132**
"Susie," Gorilla, 125
Swallows, Barn, **118**
Swan, White, nesting, 71
Swanson, George, 34
Syncerus caffer, 70

T

Tamias striatus lysteri, 133-140
Tee-Van, John, "Old-timer," 21-22
  book review, "The Amateur Scientist," 24
    "Handbook of Frogs and Toads," 47
Testudo tabulata, 21
Thorne, Samuel, 96
Threadfish, **13**
Tortoise, South American, 21
"Toto," Gorilla, 127
Triggerfish, **13**
Trogon, Red-bellied, 106
Turkey, Wild, **116**

U

Uca, 31
  pugnax, 33
Umbrella Bird, **2**
  Bare-necked, 104
Urania, moth, 34, **opposite 34**
Urbain, Prof. Achille, 43

V

VanderPyl, Mrs. John, 23
von Hagen, Dr. V. Wolfgang, **105**
Vulture, Griffon, "Old Nellie," **Cover No. 5**, 97

W

Wallaby, Gray, 22
Wanderoo, **84**
White, Farmer Aaron, 45
Wolf, Gray, 111, **112**
Woodchucks, 141

X

Xiphophorus susurrans jardinei, 29

Y

Yak, **68**

Z

Zebra Fish, **Cover No. 1**
Zebu, **65**
Zeledon, Ornithologist, 3
  Señora Amparo, 104
Zoo, drawing of, **50, 51**
Zuloaga, Dr. Guillermo, 34

THE AMERICAN BISON

by

MARTIN S. GARRETSON

Here is the whole story of the largest animal in North America, from its discovery by the Conquistadores 400 years ago until today. "The American Bison" delves into the prehistoric origin of the bison, searches the writings of early explorers for accounts of it, pictures its wide range and incredible numbers. This is the story of exploitation, near-extermination, and the rise of a strong national sentiment that saved the species.

254 pages, 65 illustrations *$1.50*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

PRESENT DAY MAMMALS

by

CLAUDE W. LEISTER

Students in Zoology and Biology classes, as well as the general reader who has often been puzzled by the relationship of mammal groups, will find this an invaluable reference work. Compact yet comprehensive, it is nothing less than an illustrated chart of the Orders of mammals. Typical representatives of every Order of mammals are pictured, and there is a clear text explaining the zoological status of the animals.

74 pages, 106 illustrations *50 cents*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

TROPICAL WILD LIFE IN BRITISH GUIANA

by

WILLIAM BEEBE, G. INNESS HARTLEY & PAUL G. HOWES

Under the prosaic subtitle of "Zoological Contributions from the Tropical Research Station" Dr. Beebe and his associates produced a fascinating survey of subhuman life in a tropical jungle—mammals, birds, reptiles, insects, fish. Here are elaborate notes on the curious Hoatzins, descriptions of a tropical expedition at work, scores of magnificent jungle pictures. An early book by Dr. Beebe, but one packed with interest.

504 pages, 143 illustrations *$1.50*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

SERPENTS of the NORTHEASTERN STATES

by

RAYMOND L. DITMARS

There are many books on the identification of our local snakes, but this is still the simplest and in many ways the most practical for the layman who wants to know enough about snakes at least to keep out of their way! It tells what snakes are found in the Northeastern States, where they are most likely to be found, what to do if you are bitten by a poisonous snake, what they look like. Photographs of every species in this area.

60 pages, 41 illustrations *50 cents*

Department B
Zoological Park, Bronx Park,
New York 60, N. Y.

moore

SMITHSONIAN INSTITUTION LIBRARIES
3 9088 01261 4566